Registered at the G.P.O. for Transmission to Canada and Newfoundland by Magazine Post.

VOL. 27. Ser. A. Part 1. pp. 1–48. JANUARY, 1939.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL INSTITUTE OF ENTOMOLOGY.

LONDON:
THE IMPERIAL INSTITUTE OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.

Price 3s. net.

IMPERIAL INSTITUTE OF ENTOMOLOGY.

Executive Council.

Lieut.-Colonel GEORGE P. VANIER, D.S.O., M.C., *Chairman*, Canada.
F. J. DU TOIT, *Vice-Chairman*, Union of South Africa.
Sir DONALD FERGUSSON, K.C.B., United Kingdom.
F. L. MCDOUGALL, C.M.G., Australia.
NEVILL L. WRIGHT, F.I.C., New Zealand.
J. M. ADAMS, F.R.C.Sc. (I), Eire.
D. JAMES DAVIES, C.B.E., Newfoundland.
SHAMALDHARI LAL, India.
B. F. WRIGHT, Southern Rhodesia.
J. A. CALDER, Colonies, Protectorates and Mandated Territories.
Sir DAVID CHADWICK, K.C.M.G., C.S.I., C.I.E., *Secretary*.

Director.
Sir GUY A. K. MARSHALL, C.M.G., F.R.S.

Assistant Director and Editor.
Dr. S. A. NEAVE, O.B.E.

Assistant Director and Superintendent of Farnham House Laboratory.
Dr. W. R. THOMPSON, F.R.S.

Head Office—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41, Queen's Gate, London, S.W.7.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

VOL. 27.
(1939.)

ISSUED BY THE IMPERIAL INSTITUTE OF ENTOMOLOGY.

LONDON:
THE IMPERIAL INSTITUTE OF ENTOMOLOGY,
41, QUEEN'S GATE, S.W.7.

1940.

IMPERIAL INSTITUTE OF ENTOMOLOGY.

Executive Council.

F. J. DU TOIT, *Chairman*, Union of South Africa.
Dr. WILLIAM ALLEN, *Vice-Chairman*, Canada.
Sir DONALD FERGUSSON, K.C.B., United Kingdom.
F. L. MCDOUGALL, C.M.G., Australia.
NEVILL L. WRIGHT, F.I.C., D.I.C., New Zealand.
J. M. ADAMS, F.R.C.Sc. (I), Eire.
D. JAMES DAVIES, C.B.E., Newfoundland.
SHAMALDHARI LAL, India and Burma.
B. F. WRIGHT, Southern Rhodesia.
J. A. CALDER, C.M.G., Colonies, Protectorates and Mandated Territories.
Sir DAVID CHADWICK, K.C.M.G., C.S.I., C.I.E., *Secretary*.

Director.

Sir GUY A. K. MARSHALL, C.M.G., F.R.S.

Assistant Director and Editor.

Dr. S. A. NEAVE, O.B.E.

Assistant Director.

Dr. W. R. THOMPSON, F.R.S.

Head Office—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41, Queen's Gate, London, S.W.7.

ERRATA.

Page 9 line 23 for "*hemorrhoidalis*" read "*haemorrhoidalis*"

,, 31 line 4 for "*rosea*" read "*rosae*"

,, 32 21 lines from end for "*L. implicita*" read "*L. hirticula*"

,, 50 20 lines from end for "a synonym of" read "the species subsequently named"

,, 62 19 lines from end for "FRAPPA (M. C.)" read "FRAPPA (C.)"

,, 97 13 lines from end for "Pistoia" read "Ravenna"

,, 106 line 9 for "*melonella*" read "*mellonella*"

,, 110 line 20 for "*armoraceae*" read "*armoracae*"

,, 236 lines 23 & 24 for "where there are few Aphids [*cf.* **25** 389] in districts in which Aphids are numerous," read "where there are few Aphids [*cf.* **25** 389]. In districts in which Aphids are numerous,"

,, 294 9 lines from end for "*Milletia*" read "*Millettia*"

,, 349 line 14 for "*Chilochorus* sp." read "*Chilocorus* sp."

,, 385 7 lines from end for "*Areta carnea*" read "*Oreta carnea*"

,, 409 transpose lines 3 & 4

,, 455 line 13 for "*melonella*" read "*mellonella*"

,, 497 22 lines from end for "[**20** 406; **22** 418]" read "[**20** 406; **21** 418]"

,, 510 18 lines from end for "$1\frac{1}{2}$ oz." read "$1\frac{1}{4}$ oz."

,, 517 line 3 for "*P. pityocampa*" read "*T. pityocampa*"

,, 576 14 lines from end for "*depresella*" read "*depressella*"

,, 581 line 26 for "*P. agilis*" read "*P. silvestris*"

,, 587 11 lines from end for "*campelinus*" read "*camelinus*"

,, 595 line 4 for "*Platystrophus* " read "*Platysystrophus*"

,, 612 line 15 for "*Plectoptera reflexa*" read "*Plecoptera reflexa*"

,, 641 line 16 for "*Physalus peruviana*" read "*Physalis peruviana*"

,, 641 4 lines from end for "*fascialis*" read "*facialis*"

,, 658 line 1 for "(*Hysteronema*)" read "(*Hysteroneura*)"

,, 677 line 10 for "*Dirhinus*" read "*Dirhicnus*"

IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES A.

VOL. 27. 1939.

JARY (S. G.) & AUSTIN (M. D.). **Tests of Ovicidal Washes against *Tetranychus telarius* L. on Hops.**—*J. S.-E. agric. Coll.* no. 42 pp. 60–63, 7 refs. Wye, Kent, July 1938.

The following is the authors' summary: An account is given of laboratory trials carried out with three thiocyanate washes and monochlornaphthalene against eggs of *Tetranychus telarius*, L., on hop foliage, at concentrations ranging from 1 : 250 to 1 : 2,000. At a concentration of 1 : 250, dodecyl rhodanate was not significantly superior to monochlornaphthalene, but both these substances were more ovicidal than the remainder. At all other concentrations, dodecyl rhodanate was significantly more ovicidal than the remaining three substances.

JARY (S. G.). **Investigations on the Insect and allied Pests of cultivated Mushrooms.—XII. Two more Tyroglyphid mites.**—*J. S.-E. agric. Coll.* no. 42 pp. 66–81, 8 pl., 5 refs. Wye, Kent, July 1938.

The author states that he is in general agreement with the conclusions as to the classification of the Tyroglyphids of the tribe CALOGLYPHINI in a recent paper by Zakhvatkin [*R.A.E.*, A **26** 94] and gives a translation of the French summary of this paper. He then discusses the principal characters and identity of two mites found on cultivated mushrooms in England during recent years. One of these is a species of *Eberhardia*, apparently distinct from *E. alberti*, Zkhv., the other a species of *Caloglyphus* possibly identical with *C. berlesei*, Mich., though there are certain points of difference between them.

In the laboratory, the mites were reared at 20–21°C. [68–69·8°F.] in glass cells on a thin layer of sterile mushroom compost with small pieces of mushroom for food. The adults of the species of *Caloglyphus* usually lived for at least 3 weeks. The maximum number of eggs laid by a female was 325; there was no evidence of parthenogenesis. Development from egg to adult required 8–15 days, or longer if the hypopial stage occurred. The duration of this stage was normally about 3 days, although it varied considerably. Hypopi were produced freely; they apparently occurred regularly in colonies resulting from the

(2712) Wt. P9/3656 1700 1/39 S.E.R. Ltd. **Gp. 432.** [A] A

pairing of two individuals of the same parentage. In one of the two localities in which this species has been recorded, it was found in holes in the caps of mushrooms; in the other, only hypopi were found. It was uncommon in both cases and occurred with other Tyroglyphids. From the rearing experiments, it appeared likely to be more prevalent in the wetter parts of beds or on over-ripe mushrooms.

Under the same conditions of rearing, the adults of the species of *Eberhardia* also lived for at least 3 weeks and the duration of the immature stages averaged 11 days. The hypopial stage of this species was not produced so freely; when it occurred it lasted 2–3 days. This mite was recorded from two localities; in one of them it seemed to be injuring the caps of the mushrooms by eating out large cavities, and in the other it apparently caused the crop to fail almost completely, being present in swarms in the compost. It appeared to prefer dry conditions. In the breeding cells, both species readily ate the mushroom tissue.

JARY (S. G.), AUSTIN (M. D.) & PITCHER (R. S.). **The Control of Big Bud Mite, *Eriophyes ribis* (Westw.) Nal. by Lime Sulphur.**—*J. S.-E. agric. Coll.* no. 42 pp. 82–92, 10 refs. Wye, Kent, July 1938.

An account is given of experiments in the south-east of England on the effect of different concentrations of lime-sulphur in sprays against *Eriophyes ribis*, Nal., on heavily infested black currant bushes, to investigate the possibility of reducing the usual concentration of 1 : 12 in the yearly spray without loss of efficiency. In the laboratory, concentrations of lime-sulphur down to 1 : 5,000 gave an almost complete kill when applied as a contact spray, as did sprays containing 1·6 per cent. or more of refined petroleum oil.

In the field, the effect of sprays applied at the usual time, immediately prior to the flowering period, is almost entirely due to their residual action, which must persist for about a month to be fully effective. When applied at this time the oil spray was useless, but concentrations of lime-sulphur of 1 : 12, 1 : 30, 1 : 60 and 1 : 100 markedly reduced infestation, the higher concentrations to a greater extent than the lower, especially in 1936. At the end of two years, the degree of infestation was very similar in plots receiving 1 : 12 and 1 : 100. Frost occurred at about the time of spraying in 1936; unsprayed plots and those receiving the oil spray showed no injury to the leaves, but some to the flowers; all plots sprayed with lime-sulphur showed both leaf and flower-bud injury, which were very marked on the 1 : 12 plots and became much less with decreasing concentration until, on the 1 : 100 plots, leaves were little affected though flower-buds were still badly injured. In the absence of frost in 1937, a concentration of 1 : 12 considerably retarded leaf development, but seemed to cause little actual injury.

In a subsidiary test, lime-sulphur at a concentration of 1 : 100 was applied to otherwise untreated bushes at the end of the flowering period, when migration of the mites was in full progress. It did not appreciably reduce subsequent infestation, possibly owing to the protection afforded by the foliage, though many of the mites were killed, and it caused considerable injury to the leaves. It thus appears that the only effective kill of the mites is obtained by lime-sulphur deposit on the big-buds themselves.

ROLFE (S. W.). **Notes on Diplopoda V. The Recognition of some Millipedes of economic Importance—II.**—*J. S.-E. agric. Coll.* no. 42 pp. 214–215, 5 figs., 2 refs. Wye, Kent, July 1938.

A note is given on the method of specific identification of female millepedes by characters of the vulvae, together with figures of those of the five species of Iulids mentioned in a previous paper [*R.A.E.*, A **25** 706].

SERVADEI (A.). **Reperti sulla biologia e morfologia della** *Galerucella nymphaeae* **L. (Col. Chrysomelidae).** [Data on the Biology and Morphology of *G. nymphaeae*.]—*Redia* **24** pp. 1–31, 20 figs., 1 pl. Florence, 10th April 1938.

Detailed descriptions are given of all stages of *Galerucella nymphaeae*, L., with a list of its recorded food-plants and an account of observations on its bionomics in Emilia, where it was found attacking the leaves of the water lily, *Nymphaea alba*, in marshes and along drainage channels and has two overlapping generations a year. In general, overwintered adults appear towards the end of April and mate after feeding. The eggs are laid early in May in batches of 12–18 on the leaves. The larvae hatch in about a week, feed on the leaves and pupate on them towards the end of May. The first-generation adults emerge towards the end of June, and females oviposit in July. The resultant larvae mature in September, and the adults appear in October, throughout which month they feed on the leaves. Larvae of this Galerucid were parasitised by an unidentified Eulophid of the genus *Pleurotropis*. A host larva may contain 5–8 parasites, which subsequently pupate in it. If control measures are required, an arsenical insecticide should be used, unless the water is stocked with fish. In tanks and small lakes, the leaves may be submerged for 2–3 days to free them from infestation.

VENTURI (F.). **Contributi alla conoscenza dell'Entomofauna delle Graminacee. V.** *Contarinia tritici* **Kirby (Dipt. Cecidomyidae).** [Contributions to the Insect Fauna of Graminaceae. V. *C. tritici*.]—*Redia* **24** pp. 57–95, 22 figs., 3 pls., many refs. Florence, 15th July 1938.

In this paper, which is one of a series [*cf. R.A.E.*, A **25** 284], detailed descriptions are given of all stages of *Contarinia tritici*, Kirby, and a brief account of its life-history in Emilia, where the larvae attack the blossoms of wheat and *Agropyrum repens*. In this region it had one generation a year, and the adults emerged at the end of April and paired within a few hours. The males died in 2 or 3 days. In breeding experiments, the females were never seen to feed. Oviposition began in mid-May and extended in some localities into June. The eggs were deposited between 5.30 and 7 p.m.; 8–20 were observed in a single wheat blossom and 1–7 in a blossom of *A. repens*. The larvae hatched in 4–5 days early in June and fed on the floral organs or the young caryopsis; if food was scarce, they fed also on the base of the glumes. No excreta were found in the blossoms. The larvae became full-fed in 6–7 days and then dropped to the ground, in which they burrowed to a depth of about an inch and formed cells in which they pupated in the following April. A list is given of the parasites of this Cecidomyiid recorded in the literature. The only one bred by the author

was an unidentified Scelionid that had one generation a year ; the larva fed within the larva of the host, and the adult emerged in April.

If abundant, *C. tritici* injures wheat severely. The best preventive measure is the cultivation of early-maturing varieties of wheat, so that the caryopsis will be formed when the larvae hatch. The chemical control measures tried in Sweden [**25** 69, 798] are considered to be impracticable, owing to the difficulties involved in their application and their high cost.

Lucchese (E.). **Contributi alla conoscenza dei lepidotteri del melo. I.** *Cydia pomonella* **L.** [Contributions to the Knowledge of the Lepidoptera infesting Apple. I. *C. pomonella*.]—*Boll. Lab. Zool. Portici* **30** pp. 323–370, 28 figs., 2 pp. refs. Portici, 31st July 1938.

In this paper are given the results of observations on the bionomics of *Cydia pomonella*, L., in relation to the phenology of its principal food-plants, in the region of Naples, where it infests apple, walnut, pear, quince, apricot, peach and plum. All stages and both sexes of the adult are described.

Diagrams show the dates of adult emergence in 1934–37 and those of the blossoming of apple in relation to temperature and rainfall. Apple began to blossom about 20th April, and walnut almost contemporaneously, whereas pear and quince did so in the first ten days of the month. Emergence of adults of *C. pomonella* began about 20th April and had reached or passed its daily maximum when the last apple petals had fallen. The first eggs were laid in the first third of May, when the apple fruitlets were at very dissimilar stages of development and a few tardy blossoms were opening. The egg stage averaged 11 days early in May, about 9 days at the end of May and 6 days at the end of June. The larvae at once sought to enter the fruit, and had begun to pupate in mid-June. The pupal period lasted 10–13 days, and the first-generation adults continued to emerge in numbers up to mid-August. They became scarce in the first week of September. The larvae of the second (overwintering) generation began to spin cocoons about 20th July, at which date some first-generation larvae of the same age or even younger were still present. Under laboratory conditions, none of the early second-generation larvae produced adults in the same year, whereas 93 per cent. did so after hibernation. Field observations also suggest that a third generation is not produced.

The egg-parasite, *Trichogramma evanescens*, Westw., was too rare to be of importance in the control of *C. pomonella*. Of larval parasites, *Ascogaster quadridentata*, Wesm., was the most numerous. The Tachinid, *Leskia aurea*, Fall., has been recorded from larvae of *C. pomonella* in this region [*R.A.E.*, A **4** 16], but the author bred it only from *Aegeria* (*Synanthedon*) *tiphiaeformis*, Bkh., and in experiments it parasitised the latter and refused *C. pomonella*.

Arsenical sprays are the most effective against the larvae, and, in this region, spraying should begin in the first third of May. By spraying earlier, the setting of the blossoms would be endangered and bees would be poisoned. A second spray is required about 25th May and a third not later than 20th June, while a fourth, early in July, is advisable against late larvae of the first generation and early larvae

of the second. This spray affords protection for some time, especially as rain seldom occurs.

All fallen infested fruit should be destroyed immediately. Walnuts should not be heaped in the open, but should be kept in wire gauze cages with rags in which larvae leaving them will spin their cocoons. Trap bands of rags should be placed on the trunks before mid-June, and should be examined for larvae up to the end of August at intervals of not more than 10 days. Bands in which the larvae have overwintered should be removed not later than March and should be placed in cages to allow parasites to escape and the spring emergence of the adults to be noted. Bait-traps, tested for the purpose of ascertaining adult emergence, only attracted a few moths and did so much later than the date of their appearance in the field.

DELLA BEFFA (G.). **L'*Oligotrophus bergenstammi* Wachtl (Diptera, Cecidomyidae) e danni arrecati in Piemonte ai peri.** [*Apiomyia bergenstammi* and Injury caused in Piedmont to Pears.]—*Boll. Lab. sper. Fitop. Torino* **15** no. 1–2 pp. 1–19, 8 figs., 11 refs. Turin, 1938.

Apiomyia (*Oligotrophus*) *bergenstammi*, Wachtl, which is known to occur in Corfu, Sicily and Tuscany and has been recorded on several varieties of pear, has been observed during the past two or three years causing considerable injury to one variety in Piedmont, though two others were not attacked. All stages of this Cecidomyiid and the adults of both sexes are described. It has one generation a year and hibernates as a mature larva. In Piedmont in 1937 and 1938, the adults occurred from mid-March to mid-April. Atmospheric conditions had little influence on the date of emergence, as the pupae are well protected in their cells. The adults live only a few days and are active only in sunny, calm weather. The eggs are laid in the buds or on the twigs near them, and the larvae hatch in 7–10 days and penetrate the parenchyma, causing galls on the buds or twigs, which wither if the infestation is severe. The removal of infested twigs is the only control measure available.

Of the two endoparasites, *Oxyglypta rugosa*, Ruschka, and *Platygaster oscus*, Wlk., recorded in the literature, the latter was bred in considerable numbers by the author from material taken in Piedmont. This Scelionid oviposits in the egg of the host, and the larvae develop in those of the latter and pupate in spring. Generally only one parasite emerged from a single host, but up to four were occasionally observed. The comparative rarity of *A. bergenstammi* is attributed to the control exercised by this parasite.

COSTANTINO (G.). **Sulla presenza del maschio dell'*Icerya purchasi*, Maskell. Nota preliminare.** [On the Occurrence of the Male of *I. purchasi*. Preliminary Note.]—*Boll. Zool.* **9** no. 3–4 pp. 115–123, 2 figs., 18 refs. Turin, 1938.

A review of the literature shows that the male of *Icerya purchasi*, Mask., is regarded as somewhat rare. In Italy it was not observed until 1909, although this Coccid had been introduced in 1900. The author has collected over 2,000 immature or adult males, mostly on *Spartium junceum* and *Genista aetnensis*, in Sicily since 1935, indicating

that they are of comparatively common occurrence in the localities concerned, and observed numerous male third-instar larvae and pupae in a colony of the Coccid reared on mandarin orange in a cage.

Regueral (F. G.). **L'huile d'olive comme insecticide.**—*Fruits & Prim. Afr. N.* **8** no. 89 pp. 245–247. Casablanca, September 1938.

The author gives a number of formulae for the preparation, with different emulsifiers, of stock emulsions containing 2 gals. olive oil with the addition of ¾ gal. kerosene to lower its viscosity and states that all of them have given very satisfactory results when used on an extensive scale against Coccids and Aphids in Valencia. They are diluted in 100 and 66 gals. water for summer and winter use, respectively, against Coccids and in 200 gals. water against Aphids. They have caused no injury to fruit, foliage or buds of orange trees unless applied in bright sunlight. Other more sensitive fruit trees, such as apples, pears and plums, should, if possible, be sprayed in winter. A comparison shows that the cost of spraying is much less with olive oil than with mineral oil.

Stritt (W.). **Die Wiederentdeckung der Blattwespe** *Pontania purpureae* **Cam. (Hymenoptera : Tenthredinidae).** [The Re-discovery of the Sawfly *P. purpureae*, Cam.]—*Arb. morph. taxon. Ent. Berl.* **5** no. 3 pp. 249–252, 4 figs., 9 refs. Berlin, 11th August 1938.

Sawflies reared from larvae rolling the leaves of willow (*Salix purpurea*) near Karlsruhe were identified as *Nematus* (*Pontania*) *purpureae*, Cam. Adults of both sexes are described, the male for the first time, and characters distinguishing them from those of *N.* (*P.*) *proxima*, Lep., are tabulated.

Tagung der " Arbeitsgemeinschaft zur wissenschaftlichen Förderung der Hausbockkäfer-Bekämpfung. [Meeting of the Association for the scientific Advancement of Measures against *Hylotrupes bajulus*, L.]—*NachrBl. dtsch. PflSchDienst* **18** no. 7 pp. 61–62. Berlin, July 1938.

Kunike (G.). **Zur Hausbockbekämpfung.** [Control of *H. bajulus*.]—*T.c.* no. 8 pp. 73–74, 8 refs. August 1938.

The final statistics of a survey of buildings in Germany, discussed at a meeting in Berlin on 27th June 1938, of the association for the scientific advancement of measures against *Hylotrupes bajulus*, L. showed that infestation by this Cerambycid was even more widespread than had been feared by experts. Infestation was recorded in 54,957, or 41·46 per cent., of the 132,577 buildings examined, and the percentage in some regions was 70–80 [*cf. R.A.E.*, A **26** 599]. In about 33,000 buildings, large portions of the structural woodwork were threatened.

In the second article is reproduced a resolution passed at the above meeting, to the effect that destruction in from 30 to 40 thousand attics has progressed until the structural strength of from 40 to 100 per cent. of all the parts is now endangered, that present-day building methods favour the beetle, and that organised measures are urgently needed throughout Germany, the costs of which should be defrayed by a levy on all owners of buildings. The German literature on *H. bajulus* and its control is briefly surveyed.

Sellke (K.). **Der Pfirsichtriebbohrer** (*Cydia molesta* **Busck**). [The Peach Shoot Borer.]—*NachrBl. dtsch. PflSchDienst* **18** no. 8 pp. 69–73, 2 maps, 18 refs. Berlin, August 1938.

This is a survey from the literature of the world distribution, life-history, food-plants and control of *Cydia molesta*, Busck. As their temperature requirements are similar, it is to be assumed that it may spread in Europe throughout the regions in which *Cydia* (*Carpocapsa*) *pomonella*, L., has become established.

Götz (B.). **Sinnesphysiologische Untersuchungen an Schmetterlingsraupen und ihre praktische Bedeutung.** [Investigations on the Physiology of the Senses in Lepidopterous Larvae and their practical Value.]—*Anz. Schädlingsk.* **14** pt. 8 pp. 92–93, 8 refs. Berlin, 15th August 1938.

The author briefly reviews from the literature the results of recent work by himself and others in Germany on the physiology of the senses in Lepidopterous larvae. They have been shown to have very little sense of smell or of taste. As regards sight, the larvae can differentiate shapes, and the sense of touch governs their choice of a place for pupation. The practical conclusions are that the taste and smell of an insecticide are immaterial, that colour may enhance the effect of repellents and attractants, and that suitable dimensions and darkness may render trap-bands attractive to larvae about to pupate [*cf. R.A.E.*, A **26** 419].

Madel (W.). **Speckkäferlarven als Zerstörer von Holz- und Mauerwerk.** [Dermestid Larvae as Destroyers of Timber and Masonry in Buildings.]—*Anz. Schädlingsk.* **14** pt. 8 pp. 93–95, 4 figs. Berlin, 15th August 1938.

A large building in Germany that had been cleaned and vacated in the autumn of 1937, after having been used for the storage and shearing of rabbit skins, was found to be infested by Dermestids. Inspection in January 1938 revealed thousands of overwintered adults, three larvae and one pupa. Skirting boards were riddled with mines made in the autumn by larvae about to pupate. Floor-boards were also mined, and the larvae had even bored into the mortar and stonework of the walls. *Dermestes lardarius*, L., was the commonest species found, the others being *D. peruvianus*, Lap., *D. frischi*, Kug., *Attagenus pellio*, L., *Anthrenus verbasci*, L., and *Ptinus tectus*, Boield.

Schedl (K. E.). **Blattwespen-Notizen.** [Sawfly Notes.]—*Anz. Schädlingsk.* **14** pt. 8 p. 100, 1 fig. Berlin, 15th August 1938.

In 1936–37, sawflies were abundant on larch in two districts in Holstein, and appeared to be causing severe injury over an area of 500 acres to trees about 10 years old. *Pristiphora* (*Lygaeonematus*) *laricis*, Htg., and, in smaller numbers, *P.* (*L.*) *wesmaeli*, Tischb., were the species concerned. At the same time the roots were attacked by Lamellicorn larvae, and this is considered to be the primary cause of the injury to the trees.

It is stated that newly emerged females of *Diprion pini*, L., and *D. similis*, Htg., can be distinguished by the fact that the tip of the abdomen is yellow in the former and greeny blue in the latter.

ARNDT (W.). **Der Brotkäfer als Zerstörer von Reptilienstopfpräparaten.** [*Sitodrepa panicea* as a Destroyer of stuffed Specimens of Reptiles.] —*Bl. Aquar.- u. Terrarienk.* 1938 pt. 6 pp. 90–91, 2 figs., 3 refs. Brunswick, 1938.

A specimen of a lizard stuffed with sand, which had been brought to Germany from Algeria in 1927, was found in 1937 to be heavily infested by *Sitodrepa panicea*, L., among which were a few examples of the Pteromalid parasite, *Lariophagus distinguendus*, Först. (*utibilis*, Tucker). As the first adults of *S. panicea* appeared in the room only after nine years, the specimen must have become infested in Germany.

ZACHER (F.). **Die Gliedertiere (Arthropoda) der Mühlen und Getreidespeicher in Deutschland.** [The Arthropods of Flour Mills and Grain Warehouses in Germany.]—*Mitt. Ges. Vorratsschutz, Sonderheft VII. int. Kongr. Ent. Berlin 15–20. Aug. 1938*, 48 pp. Berlin, 1938.

This list of Arthropods, predominantly insects, found in flour mills and grain warehouses in Germany is arranged in systematic order, the locality, date of record, and, in many cases, geographical distribution being noted for each species.

KANGAS (E.). **Zur Biologie und Verbreitung der *Pissodes*-Arten (Col., Curculionidae) Finnlands.** [On the Biology and Distribution of the Species of *Pissodes* of Finland.]—*Ann. ent. fenn.* **4** pts. 1–2, pp. 1–20, 73–98, 9 figs., many refs. Helsingfors, 1938.

An account is given of observations on the bionomics of the species of *Pissodes* in Finland [*cf. R.A.E.*, A **23** 433] with notes on their local distribution and lists of the food-plants from which they have been recorded from the literature.

The adults of *Pissodes validirostris*, Sahlb., for which there are also a few records from spruce, gnaw the branches, shoots and cones of pines and oviposit in young, green, first-year cones. The larvae develop in the cones and either give rise to adults in the autumn or hibernate. The author has bred the Braconids, *Calyptus strigator*, Thoms., *Apanteles* sp., and *Coeloides* sp. from the larvae. *P. notatus*, F., attacks young pines almost exclusively, but has also been recorded from spruce and larch. The adults gnaw the bark, buds and young shoots and often cause considerable damage. The eggs are laid in the bark, and the larvae, which are frequently attacked by fungi, are in general quite secondary pests. The commonest and most active parasites of the larvae include two species of *Coeloides* and one each of *Microbracon* (*Bracon*) and *Pimpla* (*Epiurus*). A single example of *Angitia fenestralis*, Hlmgr., was also bred from a larva. *P. pini*, L., has not yet been observed on spruce in Finland, although it is the commonest species of its genus, being particularly numerous in the north. The larvae develop in the trunks of both old and young pines and adult feeding has been observed in pines of all ages. *Coeloides stigmaticus*, Hellén, was bred from the larvae.

Very little is known of the life-history of *P. gyllenhali*, Sahlb. The adults attack pines in the same way as those of *P. notatus*, and are especially harmful to young trees. In June 1934, the author observed a newly emerged adult under the bark of the stump of a

spruce felled after injury by fire. Observations by other workers indicate that the larvae also live in spruce. The main adult flight occurs in June and the eggs are laid in spruce. *P. harcyniae*, Hbst., is definitely limited to spruce, and its larvae occur in trees of all ages except young ones. They are primary pests and often cause the trees to wither, but many are killed by the flow of resin. No parasites were bred from this species, but 25 per cent. of the larvae from one tree were parasitised and some had been killed by fungi. *P. piniphilus*, Hbst., is a very typical pine species. The adults and larvae occur on both old and quite young trees, and the adults cause the same injury as *P. notatus*. Observation in north Finland indicated that a generation is completed in from 18 months to two years.

Kamiński (E.). **O pojawie niektórych szarańczaków na Wołyniu w 1937 r.** [The Occurrence of certain Locusts in Volhynia in 1937.] —*Roczn. Ochr. Rośl.* **5** no. 3 pp. 8–14, 14 refs. Warsaw, 1938.

The scanty records of the occurrence of locusts in Poland are reviewed. There was an outbreak of *Locusta* (*Pachytylus*) *migratoria*, L., in 1859, and the same species, together with *Calliptamus* (*Caloptenus*) *italicus*, L., occurred locally 30 years later. Only isolated locusts were observed subsequently (in 1932 and 1933), but in 1937 *C. italicus* and *Oedipoda coerulescens*, L., occurred in numbers in the Province of Volhynia, and *L. migratoria*, *Chorthippus* (*Stenobothrus*) *apricarius*, L., and *Omocestus* (*S.*) *hemorrhoidalis*, Charp., were also present there. They appeared in a district on the left bank of the river Styr, in a locality with dry, sandy soil, some of the land being cultivated and some lying fallow, but *C. italicus* was the only species of economic importance ; it attacked rye and to a less extent oats in late June and early July, gnawing the stems at the base of the ears and causing the latter to drop. The possibility of outbreaks of *L. migratoria* and *C. italicus* in Volhynia is briefly discussed, and it is pointed out that they might breed on the banks along the middle part of the river Styr, which are dry, exposed to the sun and covered with only sparse vegetation. Though no egg-pods could be found in the soil in the infested area, an order was issued for compulsory ploughing to prevent any possible appearance of the locusts in 1938.

Prüffer (J.). **Rójka chrabąszczy w Polsce w 1937 roku.** [The Flight of Cockchafers in Poland in the Year 1937.]—*Roczn. Ochr. Rośl.* **5** no. 3 pp. 27–39. Warsaw, 1938. (With a Summary in German.)

Details are given of the occurrence of flights of *Melolontha melolontha*, L., and *M. hippocastani*, F., in different parts of Poland in 1937. Swarms of *M. hippocastani* occurred in the north-east of the country, where the adults had also been abundant in 1936 [*R.A.E.*, A **25** 762], which indicates that the life-cycle requires four or five years in different individuals of the same population.

Podkanowicz (J.). **Zasady organizacji zbierania chrabąszcza.** [The Organisation of the Collecting of Cockchafers.]—*Roczn. Ochr. Rośl.* **5** no. 3 pp. 40–59, 6 figs. Warsaw, 1938.

A programme is outlined for the organised collection of cockchafers [*Melolontha*] in deciduous and mixed forests in Poland. The places

where the beetles are likely to appear in numbers and their probable abundance should be determined by special investigations, and the collection should accordingly be carried out by groups of 6–10 men. The best time for collecting is the first 10–14 days after the beginning of the flight period, especially in warm, rainy and calm weather. The cockchafers are collected by hand from seedlings and shrubs, and brought down from trees on to sheets by jarring the trunks or shaking the branches, in which case the men must have ladders or climbing irons. The beetles are transferred to wooden covered barrels in which they are stupefied with carbon bisulphide, and are eventually destroyed, the best means being to plunge bags containing them into boiling water. It is also advisable to organize groups of children with nets to catch the female beetles when they fly at dusk low above the ground for about an hour before ovipositing.

Kovačević (Z.). **Prilog poznavanju** *Aphelinus mali*. [Contribution to the Knowledge of *A. mali*.]—*Arh. Min. Poljoprivr.* **4** no. 6 repr. 19 pp., 1 fig., 6 graphs, 21 refs. Belgrade, 1937. (With a Summary in German.) [Recd. November 1938.]

Aphelinus mali, Hald., was discovered in Jugoslavia in 1930 [*cf. R.A.E.*, A **20** 316] and has since spread throughout practically the whole country, being present wherever apples are infested by the woolly aphis [*Eriosoma lanigerum*, Hsm.]. In observations carried out between 17th October 1933 and 13th March 1935 on parasitised material collected from apple trees at frequent intervals and kept at an average temperature of 19–21°C. [66·2–69·8°F.], development from egg to adult was completed in about 20 days in summer (April–September), whereas it lasted 30–120 days, with a mean of 70, in winter (October–March). In similar material collected between 24th October 1933 and 4th April 1934, but kept at an average temperature of 11°C. [51·8°F.], the longest development occupied 133 days.

In Jugoslavia, the parasite may produce 10 generations a year if the weather is favourable. A female lays about 140 eggs and can reproduce parthenogenetically. Winter cold retards development or prolongs the diapause, but does not otherwise affect the insect, since it can resist temperatures below −25°C. [−13°F.]. If it is warm, oviposition and the emergence of adults occur till late autumn, the latter having been observed as late as the second half of November. The woolly aphis produces 12 generations a year, and *Aphelinus* is seldom able to control it completely. It has, however, greatly reduced its importance as a pest during recent years. The percentage of parasitism may vary from 20 to 90 in different years and localities. It is generally lowest in the spring, when the Aphid is breeding most rapidly, and reaches its maximum at the end of summer and in autumn.

From some of the parasitised colonies of the Aphid collected in the winter, 11 adults of the hyperparasite, *Pachyneuron aphidis*, Bch., were reared. It is thought that it attacks *A. mali* only occasionally and only in autumn.

Harel (—). **Le Phylloxera en Tunisie.**—*Rev. Agric. Fr.* **70** no. 9 pp. 340–343, 1 map. Paris, September 1938.

For more than 50 years following the establishment of extensive vineyards in Tunisia, outbreaks of *Phylloxera* were kept rare and local

and eventually eradicated by the enforcement of legislation providing for the restriction of imports, the registration and official inspection of all vineyards, notification of the presence of any unhealthy vines, burning of any found to be infested and disinfection of the soil, compulsory membership of a vinegrowers' syndicate, and the levying of a tax to cover expenses. In May 1936, however, a focus of infestation was discovered in the centre of the area where vines are most extensively grown, and the resulting inspection disclosed other foci in the neighbourhood. The infested area increased in 1937 and 1938, although burning of infested plants, disinfection of the soil with carbon bisulphide and restrictions on movement were strictly enforced. In July 1936, 13 substitutes for carbon bisulphide were tested without success. Legislation was modified in 1937, and the vine-growing areas of Tunisia were divided into 3 classes, *viz.*, those in which efforts at eradication have been abandoned though certain protective measures are continued, infested vines are allowed to remain and no tax is levied or compensation paid, those in which infestation is suspected or slight and where the legislation remains in full force and compensation is paid up to the limits of the resources of the syndicate, and those in which infestation has not been recorded and inspection is continued. The policy of building up the vineyards again by planting vines on American stocks was adopted in 1937, and the law amended accordingly in 1937 and 1938. Shoots, cuttings and rooted slips may be imported from France and Algeria, if accompanied by certain certificates and disinfected on arrival, and the packing materials disinfected or burnt, but from elsewhere, they can be imported only with special authorisation. The latter regulation applies also to direct-bearing hybrids whatever their place of origin. The general regulations for replacing destroyed vines and conditions applying to each of the three types of region are given. A nursery of American vines has been established, and instruction in the choice and cultivation of American stocks and in grafting and pruning has been organised.

ZOLOTAREVSKY (B.). **Recherches sur les foyers grégarigènes du criquet migrateur africain** (*Locusta migratoria migratorioides* **Rch. et Frm., Orth.**).—*Bull. Soc. Hist. nat. Afr. N.* **29** no. 3–4 pp. 123–240, 6 graphs, 2 fldg maps, 27 refs. Algiers, 1938.

The area of distribution of *Locusta migratoria migratorioides*, R. & F., phase *solitaria* in French West Africa stretches southwards from the sub-desert Sahel zone across the Sudan into the Guinean zone, and the area invaded by swarms is roughly the same. The seasonal migrations and breeding of swarms within it are discussed [*cf. R.A.E.*, A **20** 97; **22** 703].

Between December 1932 and June 1933, the influence of temperature and humidity on the development and maturation of this locust in outdoor cages was studied at Dia, French Sudan. At a relative humidity of 70 per cent. and a temperature of 30±10°C. [86±18°F.], isolated hoppers completed their development in an average of 31·2 days, and a number of females among them passed through six instars. When hoppers were kept crowded at average temperatures of 30–33°C. [86–91·4°F.], a relative humidity of 35 per cent. was fatal; at 45 per cent. the hopper stage lasted 36–43 days and there was a definite tendency to assume the characteristics of phase *gregaria*; in a saturated atmosphere it lasted only 25–31 days, but only 5 per

cent. of the hoppers reached the adult stage ; and at 70 per cent., which appears to be the most favourable humidity, it lasted 32–37 days and up to 45 per cent. of the hoppers became adult. Adults reared from isolated hoppers and kept at 33°C. and 70 per cent. humidity, matured very rapidly, the females in 6–7 days and the males in 5–10 ; egg laying occurred $10\frac{1}{2}$ days after moulting. Pairing and oviposition coincided with periods of stormy weather, suggesting that sexual maturation may be affected by electricity in the air.

In the field at Dia, the locusts did not become active in the morning till the temperature rose to 22°C. [71·6°F.], but remained active in the evening till it fell below 20°C. [68°F.]. Feeding ceased at 35°C. [95°F.], but the insects became active if disturbed at 45–48° [113–118·4°]. It follows that temperature is never the limiting factor in activity or sexual development in the Sudan and Sahel zone, where the times of breeding, which requires a humidity of 60–80 per cent., are determined by the latter. Outside the area inundated by Niger floods, breeding is only possible during the summer rainy season, which lasts 5–6 and 4 months in the Sudan and Sahel zones, respectively.

Detailed descriptions are given of the topography, drainage, climate and vegetation of the inundation zone, which stretches from the south-west to the north-east for 280 miles from below Sansanding to Timbuctoo, and has an average width of 62 miles. In it, the local climate is greatly modified by the presence of large sheets of water ; the soil is immersed or damp and the humidity of the air is relatively high for some time after the rainy season. The area to the north of Lake Debo, however, differs in character from that to the south. In the former, where the rainy season lasts from June to September, and the floods begin in July and reach their maximum in December, the river banks are low, so that the surrounding plains are flooded as soon as the water starts to rise, and extensive temporary lakes persist into the winter. The vegetation consists predominantly of *Echinochloa stagnina*, which sprouts only at the beginning of the floods and does not provide the locust population with a refuge from the rising water. All these factors tend to prevent the survival of locusts present at the beginning of the flood season, and none was observed there during the floods of 1932–33 and 1933–34 or in 1937.

South of Lake Debo, where the rainy season lasts from May to September–October, and the floods begin in June and reach their maximum in September, the river beds are incised, so that the surrounding plains are only flooded when the water is high. The vegetation is not strictly aquatic, and large areas are overgrown by *Vetiveria nigritana*. In spring, the local locust population is represented by a few scattered individuals of phase *solitaria*, which begin to breed in May, when the relative humidity rises and simultaneous maturation is probably brought about by storms accompanying the onset of rains. In June, during the periods of outbreaks, the country is invaded by mature swarms of phase *gregaria*, so that, by the time the floods arrive, the locust population consists of adults and hoppers of all instars of phases *solitaria* and *congregans*, and of the far more numerous hoppers of phase *gregaria*. Hoppers overtaken by floods do not migrate away [*cf.* **24** 234] but climb the grasses projecting above the water level and accomplish their development without becoming crowded or undergoing a change of phase. In the adults, sexual development is arrested by excessive humidity and breeding is continued only over the islands of higher ground. When the floods

recede in November–December, the population is still made up of the local phases *solitaria* and *congregans* and the progeny of the swarms, consisting of phases *gregaria* and *dissocians*. Breeding takes place on the ground as it becomes exposed, so that egg-laying and hatching are protracted, with the result that hoppers of all instars occur together and exist in an isolated state, and there is no chance for transformation into phase *gregaria* to occur. The adults appear in January–February, and during the dry season most of them are killed by drought, the burning of grass and trampling by cattle.

Outside the inundation zone, ecological surveys were made within the bend of the Niger river, where conditions were found generally unsuitable for the locust, as well as in areas to the south and south-west of Lake Debo, and in the Nara district. In these areas, temporary lakes and pools are formed during the rainy season, which, however, is short. Breeding begins in June, but is apparently arrested in August during the height of the rains. It is resumed in September, but ceases in October, when drought sets in. The locusts tend to become concentrated round the lakes as drought increases, but most of them disappear during the dry season. Conditions are less precarious in the area of contact between the Sahel and Sudan zones, for there the rainy season is longer and, as observed at Nara, phase *congregans* can make its appearance.

The biometrics of adults collected in different regions were studied, and the characters distinguishing phases *congregans* and *dissocians* are tabulated. The author considers that the characters attributed by Lean to each of these phases [*cf.* **24** 234] actually belong to the other one, and gives reasons for the view that the locusts collected by Lean in the southern part of the inundation zone during the floods of 1932 belonged mainly to phase *dissocians* and not to phase *congregans*.

It is concluded that, during normal years, the ecological conditions in the inundation area are unsuitable for the production of phase *gregaria*, owing to the short breeding seasons, the prolongation of oviposition and hatching, and the excessive dryness of the rainless period, and that these limiting factors would have to be suspended during one or several breeding seasons for such transformation to occur.

The early stages of the present outbreak are reconstructed [*cf.* **21** 32 ; **24** 234], and it is concluded that the first swarms reported in June 1928 at Diaka and Diafarabé must have been the progeny of swarms which arrived from elsewhere. The actual outbreak centres are located by the author in the southern part of the inundation zone and in areas adjoining it to the south and south-west of Lake Debo. The main factor affecting local ecological conditions in the outbreak areas is the height of the floods. These were low between 1896 and 1923, but exceptionally high in 1924 and 1925, when the habitat suitable for the locust was greatly extended since water penetrated inland beyond the usual inundation zone, so that a considerable population must have been built up in 1926. The rains were poor in 1926, and the fringes of the inundation zone and the higher parts of the flood plain itself, which were flooded the previous year, remained uncovered by water ; breeding could thus go on there right through the flood period and until early in 1927. The first swarms of phase *gregaria* probably made their appearance at the beginning of the 1927 rainy season, and some of their offspring must have survived the 1927–28 flood period in swarms, and passed the dry period in the northern part of the inundation zone, which does not dry up till April

and which is important in the development of an outbreak by harbouring incipient swarms during the drought, as well as round the lakes. They probably returned in May 1928 to the southern part, where their progeny was recorded in June.

FRAPPA (C.). **Sur l'intérêt des données pluviométriques locales pour la surveillance de** *Locusta migratoria capito* **Sauss. dans ses aires grégarigènes à Madagascar.**—*Bull. Soc. Hist. nat. Afr. N.* **29** no. 3–4 pp. 268–281, 1 pl., 7 refs. Algiers, 1938.

The rainfall for the last few years in the districts of Mahafaly and Androy, the part of south-western Madagascar in which the outbreak centres of *Locusta migratoria capito*, Sauss., are situated, is discussed and tabulated. Here the solitary phase normally passes through two generations during the wet season and survives the dry season in the adult or egg stage [*cf. R.A.E.*, A **22** 8]. The diapause during the egg-stage is broken by the first rains after the drought, so that it should be possible to deduce the state of embryonic development from rainfall records. The conditions leading to an outbreak (a prolonged rainy season favouring the production of three successive generations and enlarging the suitable habitat, followed by a dry year during which the habitable area becomes restricted [*cf. loc. cit.*]) have never been known to occur simultaneously throughout this outbreak area, suggesting that an outbreak can be produced by the successive occurrence of such conditions in different parts of the area. In view of this, it is important to destroy any increasing local populations so as to prevent emigration.

HALL (W. J.). **Citrus Cultivation in Southern Rhodesia.**—*Emp. J. exp. Agric.* **6** no. 22 pp. 101–111, 2 pls., 8 refs. Oxford, April 1938.

A section of this report (pp. 107–110) comprises a brief review of the chief insect pests of *Citrus* in Southern Rhodesia, and some of the measures used in their control [*cf.* next paper].

JONES (E. P.). **Entomological Review, 1936.**—*Publ. Brit. S. Afr. Co.* no. 6 pp. 3–18, 1 ref. London, 1937.

Scirtothrips aurantii, Faure, was the only insect pest that seriously damaged the 1936 crop of *Citrus* on the estates of the British South Africa Company in Southern Rhodesia. The loss it caused on the Mazoe estate was the highest experienced for many years. This was partly due to a long spell of dry weather beginning in January 1935, which favoured rapid breeding of the thrips and caused retardation of young growth and irregularities in blossoming, even within individual groves, so that it was almost impossible to time the spray applications correctly, but particularly to the fact that the lime-sulphur spray was less efficient than those used previously [*cf. R.A.E.*, A **24** 609], as the stock contained only 25 instead of 31–33 per cent. polysulphides. It is thought that with a return to the standard spray, serious outbreaks will not recur.

From January to April 1936, warm and humid weather favoured the reproduction of Coccids. Infestation by *Aonidiella aurantii*, Mask., which was generally distributed throughout the estate was, however, slight, and the resulting loss was negligible. Fumigation with

hydrocyanic acid gas produced by Cyanofumers caused severe scorching and pitting of the fruit in parts of some groves, where the work was begun at the end of April. During the first two nights of treatment of one grove, the temperature did not gradually decrease throughout the evening, but remained constant and rather high, and it is thought that this abnormal condition, and perhaps the physiological state of the trees, contributed to the production of injury. Trees in the low-lying parts of the grove were much more seriously damaged than those on higher ground. Continuous records at both levels for three weeks after injury was apparent showed that during the first few hours of the evening, when fumigation is usually in progress, the temperature and relative humidity in the lower section were both considerably higher than in the upper section. It is thought that other factors may be concerned, but, pending investigation, it is recommended that the beginning of fumigation should be delayed for 3–4 weeks, as high temperatures and relative humidities are likely to occur together only in the transitional period between summer and winter, that is, during April and early May. Details are given of tests of fumigation with liquid HCN ; this method was found efficient, but for reasons of cost cannot at present be recommended. *Coccus* (*Lecanium*) *hesperidum*, L., which has been very scarce for the last few years, increased in some parts of the estate and caused a certain amount of loss. It was considered that the most seriously affected grove should be fumigated early in 1937. It appears improbable that this Coccid will become a serious pest, as parasitism is usually very high, and, in February 1937, amounted to about 90 per cent. in the grove in question. The parasites comprise at least 7 Chalcidoids and one Cecidomyiid, none of which has as yet been identified. *Chrysomphalus pinnulifer* var. *diversicolor*, Green, which had previously been observed on *Citrus* at Mazoe only in 1928, was found on two oranges from one grove. Colonies of *Aphis tavaresi*, Del G., were present in some groves in late July and August 1935, and during January and February 1936, but caused very little damage.

The infestation of *Citrus* by *Heliothis armigera*, Hb., in August and September 1935 was one of the lightest ever known [*cf.* **24** 610]. Attempts to control the larvae with various sprays and dusts are described, and it is concluded that no efficient insecticide has yet been found against this Noctuid on *Citrus*. Early-maturing maize proved useless as a trap crop, as only a few plants survived the winter frosts.

Jones (E. P.). **The Overwintering Pupa of *Heliothis armigera*, Hubn. (*obsoleta*, Fabr.). I. Effect of Temperature and Moisture.**— *Publ. Brit. S. Afr. Co.* no. 6 pp. 19–36, 2 figs., 1 ref. London, 1937.

The following is almost entirely taken from the author's summary of this account of preliminary experiments to determine the effect of temperature and moisture on the overwintering pupae of *Heliothis armigera*, Hb., in Southern Rhodesia : Overwintering pupae formed in April and May 1936 were subjected to experimental treatment on or about 1st June. The subsequent durations of the pupal stage were as follows : 103–149 days in the controls ; 8–16 days at a constant temperature of 81°F. ; 9–39 days at alternating temperatures of 81 and 40°F. ; 130–136 days at a constant temperature of 40°F. for 3½ months ; and 190–213 days at a constant temperature of 40°F. for

5½ months. The temperatures of the insectary in which the controls were kept did not differ greatly from those recorded in the field, the weekly mean from May to December varying from a minimum of about 54 to a maximum of about 76°F. The moisture experiments were made at insectary temperatures. With one application of 0·16 inch and two applications of 0·08 inch of water per week for 6 weeks, the durations were 69–130 and 71–134 days, respectively; while pupae treated with 0·73 inch of water on 18th, 19th and 20th August gave rise to moths within 33–37 days after treatment, the total duration of the pupal period being 114–118 days.

The results of the experiments suggest that temperature can be a contributory factor in determining the time of emergence of the moths, and that such abnormal conditions as the frequent occurrence of showers of rain during the winter season will produce an earlier emergence and thus a severe infestation of *Citrus* [*cf. R.A.E.*, A **24** 611].

JONES (E. P.). **The Egg Parasites of the Cotton Boll Worm, *Heliothis armigera*, Hubn. (*obsoleta*, Fabr.), in Southern Rhodesia.**—*Publ. Brit. S. Afr. Co.* no. 6 pp. 37–105, 3 pls., 3 graphs, 17 refs. London, 1937.

The following is largely taken from the author's summary of investigations on the value of two indigenous egg-parasites, *Telenomus ullyetti*, Nixon, and *Trichogramma luteum*, Gir., for the control of *Heliothis armigera*, Hb., on *Citrus* in Southern Rhodesia. The important points in the bionomics of the host relevant to the host-parasite relationship [*cf. R.A.E.*, A **24** 611] are briefly described. In certain areas at Mazoe a daily collection of the host eggs was made throughout most of the period from November 1934 to March 1937, and the data obtained on the natural parasitism of the species from these and other isolated collections are presented in tables and graphs. *Trichogramma* was most active during the summer months of rainfall (December–March), when the host was most abundant. Activity was at a minimum during the winter and did not increase very much in the spring or in the hot months of October or November. *Telenomus* was most active during the spring. The maximum percentage parasitism by either species was not high, and the field data indicated that a natural balance had been set up between the host and parasites.

In the second part of the paper the stages and development of both species of parasites are described. Four larvae of *Trichogramma*, but only one of *Telenomus*, can develop in a single egg of the host; the durations of the immature stages at 26°C. [78°F.] averaged 9·4 and 13·8 days, respectively. *Telenomus* females have a longer period of adult life, a greater reproductive potential, only deposit one egg per host, and exercise a stringent economy in their reproduction. They have the discriminative ability almost perfectly developed and will only attack healthy, vulnerable and unparasitised hosts. They can remain active at a much lower range of temperature than *Trichogramma*, and their activities are only limited by a high humidity. The host is vulnerable to an attack by *Telenomus* for a shorter period than is the case for *Trichogramma*. The discriminative ability is imperfectly developed in *Trichogramma* and superparasitism and multiparasitism result. This waste of progeny probably accounts for the low rate of

parasitism found in the field. The life of the adult is comparatively short, and activity is limited by low temperature and low humidity.

Trichogramma is intrinsically superior to *Telenomus*, provided that the host is attacked within two days of the attack by *Telenomus*. This fact, together with the extrinsic superiority of *Trichogramma* from December to March, and the fact that *Telenomus* will not attack hosts parasitised by *Trichogramma*, brings about a gradual elimination of *Telenomus* in the field during this period [*cf.* **24** 646]. The comparatively low degree of parasitism by *Telenomus* during its period of activity is attributed to a limited host supply. Records have shown that when the host oviposition was concentrated, a comparatively high natural parasitism was obtained.

The third part of the paper deals with the economic importance of the species in relation to the infestations of *Citrus* by *Heliothis*, which occur in August and September. A method of control that promises success is the artificial breeding and liberation of parasites each year when the moths are ovipositing on *Citrus*. They could be bred during the winter, and their liberation would produce an immediate reduction of damage in the limited areas to which the *Heliothis* attacks are confined. *Telenomus* is preferable to *Trichogramma* as, apart from other disadvantages, climatic conditions do not favour the latter. It must, however, be established whether the *Citrus* grove is favourable to *Telenomus* activity, and whether the range of dispersal of the species is limited.

VAN DER LAAN (P. A.). [Tests of Insecticides.]—*Meded. Deli Proefst.* (2) no. 100 pp. 20–25. Medan, 1938.

In comparative field tests at Deli, Sumatra, in 1937, derris dusts containing 1½ and 2½ per cent. rotenone proved inferior to a 5 per cent. lead arsenate dust in protecting tobacco against Lepidopterous larvae, and in other tests no distinct difference in injury by the larvae was observed when the tobacco was dusted with 5 per cent. sodium fluosilicate or sprayed or dusted with 5 per cent. lead arsenate. In experiments against the larvae in seed beds, a derris dust mixture containing 3 per cent. rotenone gave better results than a spray of derris powder mixed with water to give a rotenone content of 1 in 10,000, but was less effective than a spray of 1½ per cent. lead arsenate.

In laboratory experiments, *Prodenia* [*litura*, F.] proved almost insensitive to derris dust and *Heliothis* [*assulta*, Gn.] was only slightly affected, but in the case of *Plusia* [*signata*, F.] 80 per cent. mortality was given in two days by a dust mixture containing 1 per cent. rotenone. Capsid bugs were very sensitive, but crickets were not. A dust containing 5 per cent. thiodiphenylamine (phenothiazine) seemed ineffective against *P. signata*.

YUASA (H.) & ENDO (T.). **Morphology and Bionomics of Immature Stages of Japanese Chafer Beetles. I.** *Anomala cuprea* **(Hope) (Résumé).**—*J. agric. Exp. Sta. Tokyo* **3** no. 2 pp. 151–182, 2 pls., 46 refs. Tokyo, March 1938. (With a Summary in English.)

This is the first paper of a series on the morphology and bionomics of the immature stages of the Lamellicorn beetles that commonly occur in the neighbourhood of Tokyo, and comprises an account of

laboratory and field observations on *Anomala cuprea*, Hope. The egg, larva and pupa are described, and characters are given distinguishing the full-fed larva from those of related species. The life-cycle lasted either one or two years, the former being more usual in Tokyo. The eggs were laid in small batches loosely in the ground, usually about 6 ins. below the surface, at intervals of 2 or 3 days from mid-July to mid-August. The number of eggs deposited by each of 10 females ranged from 24 to 220, and averaged 98. For 579 eggs, the incubation period lasted 6–18 days and averaged 9·4; in July–August, 257 out of 261 eggs hatched. The larvae fed close to the surface of the soil, hibernated from early November in earthen cells 12–20 ins. below the surface, and resumed feeding in April; individuals having a two-year life-cycle hibernated twice. Pupation occurred in earthen cells about 8–10 ins. below the surface and began early in June. The pupal stage for 10 individuals varied from 10 to 21 days. The adults were observed in the field from mid-June to mid-September, being most abundant from mid-July to early August. Their food-plants, a list of which is given, comprised more than 69 species in 34 families; they fed mainly on leaves but occasionally also on flowers and fruits.

MISAKA (K.). **Studien über den Mechanismus für Abtötung der Eier von *Chilo simplex* Butler mit Nikotinsulfat. Zweite Mitteilung: Ueber die Beziehung der Verflüchtigung des Nikotinsulfates zu seiner Eierabtötung.** [Studies on the Way in which the Eggs of *Chilo simplex* are killed by Nicotine Sulphate. Second Communication: On the Relation of the Evaporation of Nicotine Sulphate to its ovicidal Power.]—*J. agric. Exp. Sta. Tokyo* **3** no. 2 pp. 239–271, 7 figs., 37 refs. Tokyo, March 1938.

In further laboratory experiments on the action of nicotine sulphate on eggs of *Chilo simplex*, Btlr. [*cf. R.A.E.*, A **20** 433], the author investigated the relation between the vaporisation of nicotine and the lethal action of the vapour on the eggs. By the technique used, which is described in detail, a current of air was passed over eggs varying in age from 1 to 5 days, after they had been brushed with nicotine sulphate solution. Each test lasted 7 days, because the eggs hatch normally in about a week at 27°C. [80·6°F.].

It was found that the eggs are not killed by suffocation, but are poisoned by the nicotine vapour from the solution, and that their susceptibility increases as their development progresses [*loc. cit.*]. Thus, if the nicotine sulphate solution was alkaline so that the nicotine evaporated quickly, it killed the older eggs, but not the younger ones. On the other hand, if the solution was acid, so that the nicotine evaporated slowly, the small quantity of vapour failed to kill the old eggs, but killed comparatively many young eggs, because they were exposed to the gradually evaporating nicotine during development. In these experiments the vaporisation of the nicotine was regulated by adding different amounts of sulphuric acid to the solution. Other tests, however, showed that this regulation is much better obtained by using a wetter. As the alkaline wetters usually employed for nicotine sulphate solutions would have accelerated the vaporisation of nicotine, the tests were made with colloidal substances, which improve the physical qualities of the solution and limit the vaporisation by forming

a thin layer. The addition of glycerine improved the toxicity of the solutions, but the most effective ones against eggs in all stages of development were those containing 1 per cent. gum arabic.

KÔNO (H.). **Die Lymexyloniden, schädlich an Sachalintannen und Ezofichten in Sachalin und Hokkaido.** [Lymexylonids harmful to *Abies sachalinensis* and *Picea jezoensis* in Sakhalin and Hokkaido.] —*Trans. Sapporo nat. Hist. Soc.* **15** pt. 3 pp. 199–201, 2 figs. Sapporo, July 1938.

Hylecoetus matsushitai, sp. n., is described from *Abies sachalinensis* and *Picea jezoensis* in Sakhalin and Hokkaido, and *H.* (*Hylecerus*) *flabellicornis*, Schneider, is recorded from *P. jezoensis* in Sakhalin.

KUWAYAMA (S.). **On the Biology of** *Grapholitha glycinivorella* **Mats.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.* **13** no. 4 pp. 581–585. Tokyo, September 1938.

Cydia (*Grapholitha*) *glycinivorella*, Mats., is widely distributed in Japan, Korea and Manchuria and is a serious pest of soy beans. In Hokkaido in the years 1931–36, it attacked less than 10 per cent. of the beans in localities where the mean temperature from May to October did not exceed 13°C. [55·4°F.], but in other localities, infestations of up to 94 per cent. were recorded. Less than 20 per cent. of the eggs were deposited on parts other than pods [*cf. R.A.E.*, A **26** 54]. The males are more attracted to light than the females, but more females are attracted to molasses. Soy bean is the only food-plant [**26** 310], but some varieties are only slightly damaged, as they do not produce pods during the oviposition period [**24** 788].

NIXON (G. E. J.). **Asiatic Species of** *Microphanurus* **(Hym. Proctotrupöidea).**—*Ann. Mag. nat. Hist.* (11) **2** no. 8 pp. 122–139, 4 figs. London, August 1938.

A key is given to the Asiatic species of *Microphanurus*, with records of their distribution and descriptions of most of them, including six new species. *M. seychellensis*, Kieff., is recorded from Ceylon, where it was bred from the eggs of the Pentatomid, *Cantheconidea robusta*, Dist. Among the new species are *M. sulmo* from eggs of *C. robusta* in Ceylon, and *M. vindicius* and *M. priapus* from those of the Coccid, *Dasynus manihotis*, Blöte, in Java. *M. priapus* was also reared from eggs of the Pentatomid, *Chrysocoris javanus*, Westw. (*atricapillus*, Guér.).

NIXON (G. E. J.). **Two New Oriental Species of** *Macrocentrus* **(Hym., Brac.).**—*Ann. Mag. nat. Hist.* (11) **2** no. 9 pp. 314–319, 1 fig., 2 refs. London, September 1938.

Descriptions are given of both sexes of *Macrocentrus homonae*, sp. n., and *M. calacte*, sp. n.; the latter was reared from *Argyroploce* (*Cryptophlebia*) sp. on *Inocarpus* in Fiji. *M. homonae* is the parasite that has been successfully introduced from Java into Ceylon for the control of *Homona coffearia*, Nietn., on tea [*R.A.E.*, A **26** 337, 639]. It is described from material reared in Ceylon, where it is believed to have

no other host. At an altitude of 4,500 ft. (temperature 70–75°F.) its life-cycle lasts about 7 weeks, 2 of which are passed in the pupal stage. As many as 34 adults have been obtained from a single host.

Codling Moth and Black Spot Control. Apple and Pear Demonstration Plots, 1937–38.—*J. Dep. Agric. Vict.* **36** pt. 8 pp. 371–385, 416, 11 figs. Melbourne, August 1938.

A detailed account is given of experiments on the control of *Cydia pomonella*, L., and black spot on apples and pears in Victoria in 1937–38; they followed the same lines as those carried out in 1936–37 [*cf. R.A.E.*, A **26** 168]. In all districts save one, adults of two or three broods were present during the season, whereas during the previous year there were not more than two broods and the second was relatively small. In spite of this, control was satisfactorily maintained on all the plots except two, on which yields were very low and spraying inefficient.

In the first of the two schedules used against the moth on apple all the sprays contained lead arsenate; in the second, the later cover sprays were replaced by summer white oil. In some of the demonstration plots, particularly in the warmer inland districts, oil was used as early as November for the control of the first brood, and appeared to be as effective as lead arsenate, but it cannot be applied in districts where sprays of lime-sulphur are necessary for the control of black spot, on account of foliage injury.

A calyx spray was applied on all plots, and two were applied for apples that blossomed irregularly. As a result, infestation through the calyx was negligible. The calyx spray for pears was applied about three weeks after petal fall, as the calyx of the fruit closes slowly and can be more effectively filled with spray at this delayed stage, provided that the young pears have not turned over. In most cases 6–8 sprays were applied to apples, and in the second schedule 2–7 of these were of white oil. Sprays of lead arsenate were used almost exclusively for controlling the moth on pear. The cover sprays were timed by bait traps. The baits in them were the same as those used previously [*loc. cit.*], and all were effective, but lees from sweet-wine rackings gave the best results.

Evans (J. W.). **Aphides and their Control.**—*Tasm. J. Agric.* **9** no. 1 pp. 20–23, 2 figs. Hobart, February 1938.

Very brief notes are given on the bionomics of the Aphids that attack fruit trees in Tasmania, *viz.*, *Myzus persicae*, Sulz., and *Anuraphis persicae-niger*, Smith, on peach, *Myzus cerasi*, F., on cherry, and *Eriosoma lanigerum*, Hsm., on apple. The first three species are best controlled by spraying early in July with tar-distillate emulsion (1 : 35 or 1 : 40). Miscible red oil (1 : 20) is also recommended. If treatment is necessary in the spring a contact insecticide should be applied. *E. lanigerum*, which was a major pest before the establishment of *Aphelinus mali*, Hald. [*cf. R.A.E.*, A **14** 333], is now seldom of importance. In occasional cases where additional control is needed, a spray of miscible red oil (1 : 20) should be applied at high pressure during August.

Eriosoma lanuginosum, Htg., has not yet been recorded on pear trees in Tasmania, but the "cockscomb galls" caused by it on elms, which are the winter food-plant, occur in parks and gardens in Hobart.

Oak trees are severely infested by an Aphid, as well as by *Asterolecanium variolosum*, Ratz. This Coccid is parasitised by *Habrolepis dalmanni*, Westw., which was introduced in 1932 [**22** 224], and is now established in Hobart and Launceston [*cf.* **25** 321]. Small or especially valuable oaks infested with these insects and with *Paratetranychus pilosus*, C. & F., would benefit from a dormant spray of tar distillate.

Other Aphids of importance in Tasmania are *Brevicoryne brassicae*, L., on cabbage, *Cavariella aegopodii*, Scop., and *C. capreae*, F., on carrot and parsnip, *Macrosiphum rosae*, L., on rose, and an unidentified species on oats.

Evans (J. W.). **The Pear Slug.**—*Tasm. J. Agric.* **9** no. 3 pp. 130–131, 2 figs. Hobart, August 1938.

The larvae *Caliroa limacina*, Retz., which was originally introduced from Europe, causes severe damage to foliage of cherry, hawthorn [*Crataegus*] and plum in Tasmania. Pear trees are less seriously attacked, and walnut and almond are sometimes slightly infested. Emergence of the adults of the overwintered generation begins in early November and reaches a peak in the middle or at the end of the month. Males are rare and parthenogenesis occurs. The eggs are deposited under the upper layer of the surface tissue of the leaves and hatch in 1½–2 weeks. The larvae feed only on the upper surface of the leaves; some of them become full-grown at the end of December. Pupation takes place 2–4 inches below the surface of the soil, and the adults appear about a fortnight later, from mid-January onwards. The larvae of the next generation are present from late January to late February, and a few may still be found in March.

As the fruit is never attacked and infestation of the foliage appears to have little effect on the trees, measures against this sawfly are seldom attempted, although it is easily destroyed. Lead arsenate gives the best control on fruit trees, but late in the season, to avoid harmful residues, a contact insecticide such as derris or nicotine sulphate should be applied as a spray or a dust. Hawthorn hedges surrounding gardens should be given two applications of a derris dust, the first in the first half of December, and the second, which is the more important, in the first half of February. Infestation of hawthorn by *Typhlocyba froggatti*, Baker, may also be reduced by derris dusts applied in early November, and, if necessary, in late January.

Cottier (W.). *Citrus* **Pests: (1) The Dicky Rice Weevil.**—*N. Z. J. Agric.* **56** no. 5 pp. 345–346, 3 figs., 1 ref. Wellington, N. Z., 20th May 1938. (2) **The** *Citrus* **Borer.**—*Op. cit.* **57** no. 1 pp. 28–29, 3 figs. 20th July 1938.

The dicky rice weevil [*Maleuterpes spinipes*, Blkb. (*phytolymus*, Oll.)] was first recorded in New Zealand in 1935, when it was found on *Citrus* in the North Auckland district. Brief notes are given on its bionomics and control in Australia, based on a paper already noticed [*R.A.E.*, A **16** 164]. Its life-history in New Zealand is not known, but the adults are present in August and in February-March.

The Cerambycid, *Oemona hirta*, F., the adult and larva of which are briefly described in the second paper, is an indigenous species that infests a variety of native and introduced trees and shrubs and is now widely distributed as a pest of *Citrus* throughout New Zealand [*cf.* **26** 266]. The first of the two main types of damage is apparent about

December when the tips of the twigs containing young larvae die back. The second, which may be observed at any time of the year, consists of unthrifty growth or death of the larger branches in which the presence of larvae is shown by frass dropping from the galleries. In a note by E. C. S. Little, it is stated that the eggs are deposited in crevices and cut surfaces or on small twigs. The larva hatches in a few days and burrows down the centre of the twig, usually working towards the main trunk. Side galleries are bored to the exterior every few inches for the discharge of frass. The larvae are able to develop in dead wood if it is exposed to rain but not if it is dry. Pupation occurs in a cell in the larval gallery, and the pupal stage lasts 2–3 weeks. The adults, which have been observed in numbers in December, are nocturnal and are attracted to lights.

SIMMONDS (H. W.). **Coconut Pests and Diseases in Melanesia and Southern Polynesia.**—*Bull. Fiji Dep. Agric.* no. 20, 40 pp., 4 pls., 37 refs. Suva, 1938.

This is a revision of a bulletin already noticed [*R.A.E.*, A **14** 103]. Additional information includes brief accounts of work on the biological control of several coconut pests in Fiji [**18** 510; **23** 279, 608; **25** 191] and of *Sexava* spp. in the Territory of New Guinea [**24** 201].

TOWNSEND (C. H. T.). **Further Fly Parasites of** *Dysdercus*.—*Rev. Ent.* **8** pt. 3–4 pp. 347–348. Rio de Janeiro, 25th June 1938.

Descriptions are given of four more new species of flies bred from *Dysdercus* in São Paulo [*cf. R.A.E.*, A **25** 678]. They are *Hyalomyia* (*Alophoropsis*) *brasiliensis* and *H.* (*Euphorantha*) *dysderci* from *D. mendesi*, Blöte, and *D. ruficollis*, L.; and *Paraphorantha politana* and *H.* (*Phoranthella*) *mendesi* from *D. mendesi*.

Clistomorpha (*Hyalomyodes*) *brasiliensis*, Tns., and *Eutrichopoda abdominalis*, Tns., were also reared from *Dysdercus*.

ARAUJO (R. L.). **Uma bróca das palmeiras.** [A Palm Borer.]—*Biologico* **4** no. 6 pp. 189–191, 3 figs. S. Paulo, June 1938.

Descriptions are given of all stages of the weevil, *Rhynchophorus palmarum*, L., which breeds in coconut palms in Bahia, Brazil, throughout the year, together with notes on its bionomics, based on those given in a book by Bondar [*R.A.E.*, A **11** 120]. The life of the adults averages about two months. The female deposits some 250 eggs, at the rate of about 5 a day, in the soft parts of the coconut palm. The larvae hatch in 2 or 3 days, and the larval and pupal stages each last about a month. The larvae bore in all directions, even attacking the leaf-stalks. After emergence the adults mostly remain on the palm in which they have developed.

SAUER (F. G.). **A quéda dos botões floriferos e das maçãs em formação dos algodoeiros.** [The Shedding of the floral Buds and of the developing Bolls of Cotton Plants.]—*Biologico* **4** no. 6 pp. 192–195. S. Paulo, June 1938.

In the period between the appearance of the first flower buds and that of the first well developed bolls, the infestation by the pink bollworm [*Platyedra gossypiella*, Saund.] of the floral parts of cotton

plants in fields in São Paulo averaged 42 per cent. [*cf. R.A.E.*, A **26** 504]. In some fields, 69·8 per cent. of the fallen buds had been attacked. In an experimental field at Campinas 8 per cent. of the new bolls were shed by plants with uninfested flowers and 44 per cent. by plants with flowers infested by the boll worm, the corresponding percentages later in the season being 27·3 and 84·8.

FIGUEIREDO jr. (E. R.). **A mosca** *Pseudiastata brasiliensis*, **predadora da cochonilha** *Pseudococcus brevipes*. [The Fly, *P. brasiliensis*, a Predator of the Mealybug, *P. brevipes*.]—*Biologico* **4** no. 6 pp. 206–207, 4 figs. S. Paulo, June 1938.

In March 1938, while on a tour of inspection in a locality in the state of São Paulo, the author observed larvae of the Drosophilid, *Pseudiastata brasiliensis*, Costa Lima [*cf. R.A.E.*, A **26** 319] preying on *Pseudococcus brevipes*, Ckll., infesting date palms and two species of *Cyperus*. The larva, puparium and adult of the fly are described.

ARAUJO (R. L.). **Uma praga do abacateiro.** [A Pest of Avocado.]—*Biologico* **4** no. 6 pp. 207–208. S. Paulo, June 1938.

Larvae of *Papilio scamander grayi*, Boisd., were observed in January 1938 attacking the leaves of avocado, *Persea gratissima* (*americana*), in São Paulo, Brazil. The larva, pupa and adult are described. The pupal stage, which is passed on the trunk or other support, lasted 22 days.

Calendario de pulverizaciones. [Spray Calendar.]—*Circ. Estac. exp. Concordia* no. 15, 4 pp. typescript. Concordia, July 1938.

This circular includes a table showing the sprays to be employed at different times of the year against pests and diseases of *Citrus* in the region of Concordia, Argentina. More detailed directions are given for the control of the Coccids, *Chrysomphalus dictyospermi*, Morg., *C. ficus*, Ashm., *Aonidiella* (*C.*) *aurantii*, Mask., *Lepidosaphes beckii*, Newm., *Prontaspis citri*, Comst., and *Coccus hesperidum*, L., by means of sprays of 2 or 3 per cent. oil emulsions. Against *P. citri*, 6 per cent. lime-sulphur (32°Bé.) is also effective. No measures are necessary against *Icerya purchasi*, Mask., as it is satisfactorily controlled throughout the area of its distribution in Argentina by the predacious Coccinellid, *Rodolia* (*Novius*) *cardinalis*, Muls. [*cf. R.A.E.*, A **23** 366].

DE SANTIS (L.). **Una cochinilla argentina poco conocida** *Protargionia larreae*, **Leonardi.** [A little-known Argentine Coccid, *P. larreae*.]—*Rev. Fac. Agron. La Plata* (3) **21** (1936) pp. 225–240, 5 figs., 1 pl. Buenos Aires, 1938.

Descriptions are given of all stages, including the adults of both sexes, of *Protargionia larreae*, Leon., which was originally found on *Larrea* spp. in Argentina and has been observed by the author infesting the branches of ornamental plants (*Sophora japonica* and *Manihot tweediana*) in the botanical garden at La Plata. This Coccid has three generations a year, of which the adults appear in January, April and August. The females observed by the author were oviparous,

the eggs hatching in 5–6 days. For control, infested branches should be removed during pruning and a contact insecticide applied as soon as the eggs hatch. *Aphytis chrysomphali*, Merc., is the chief natural enemy of the Coccid [*cf. R.A.E.*, A **25** 760]. Others include an undescribed Encyrtid of the genus *Signiphora*, the Discolomid, *Coccidophilus citricola*, Brèthes, and unidentified Dipterous larvae.

De Santis (L.). **Tres enemigos naturales del piojo de San José en la República Argentina.** [Three natural Enemies of the San José Scale in Argentina.]—*Bol. Agric. Ganad. Ind. Prov. B. Aires* **18** no. 1–2 pp. 20–21. La Plata, 1938.

Three parasites bred from *Aspidiotus perniciosus*, Comst., on branches of apple collected in June 1937 in Argentina were identified as the Aphelinids, *Aphytis proclia*, Wlk., *A. mytilaspidis*, LeB., and *Prospaltella perniciosi*, Tower, the last two being new records for the country.

Pickles (A.). **Report of the Entomologist for the Year 1937.**—*Rep. Dep. Agric. Trin. Tob. 1937* pp. 71–72. Trinidad, 1938.

The breeding stock of *Metagonistylum minense*, Tns. [introduced for the control of *Diatraea* (*R.A.E.*, A **26** 10)] died out in Trinidad during 1937, and an additional supply was therefore obtained from Porto Rico in October. About 300 of the progeny of these flies were liberated in the sugar-cane fields before the end of the year. It was reported that of 3,000 acres of sugar-cane infested in varying degrees by the froghopper [*Tomaspis saccharina*, Dist.] 1,000 were seriously damaged, but attacks were more diffuse on the whole than in 1936. Experiments with pyrethrum dust for its control are giving good results [**26** 404]. Studies by Fennah on varietal resistance of cane to infestation have, in general, confirmed earlier results [**26** 10], and laboratory tests indicate that " stomatal number " may be an index to resistance.

Infestations by the cacao thrips [*Selenothrips rubrocinctus*, Giard] were small and scattered. One of two neighbouring blocks of cacao usually carries a much lower thrips population than the other, and has an appreciably drier atmosphere, which may be less favourable for the breeding of the thrips. A light application of hydrated lime, with a power dusting machine, gave a mortality of over 90 per cent. The treated leaves retain a coating of lime for several weeks in wet weather, and it appears to act as a repellent. The cost for materials and application is much lower than that of any spray.

Owing to reports of the presence of *Ceratitis capitata*, Wied., in Venezuela, wild and cultivated fruits were collected from all parts of Trinidad and insects were bred from them, while others were swept from trees and bushes. Of about 3,000 insects thus obtained, the majority were Trypetids of the genus *Anastrepha*, and *Ceratitis* was not found. Orange trees were damaged by the Curculionid, *Cratosomus punctulatus*, Gylh., in one district, and, on a small scale, by adults of *Lachnosterna* sp.

In further experiments on the storage of fumigated maize a covering layer of fine sand continued to give the best protection from insect attack [**26** 11]. Fumigation with cyanogas calcium cyanide, applied with a special pump, proved preferable to the usual method of exploding

carbon bisulphide for the destruction of nests of leaf-cutting ants as it was less costly and more certain, especially in the case of large colonies. A spray of a locally-produced oil emulsion effectively controlled the chinch bug [*Blissus leucopterus*, Say] infesting lawns in various parts of the island. A single application of an oil emulsion spray was effective against *Orthezia praelonga*, Dougl., on *Glyricidia*, and Aleurodids on *Ficus benjamina*. Dusting with lead arsenate checked *Coscinenta virens*, Thnb., which was completely defoliating cassava in one locality.

Shipments to Antigua were made of *Theresia claripalpis*, Wulp, against the small moth borer [*Diatraea saccharalis*, F.] on sugar-cane [*cf.* **25** 617], and of the Coccinellid, *Cryptognatha nodiceps*, Mshl., against *Aspidiotus destructor*, Sign., on coconut. There was a high mortality of *C. nodiceps* in transit, and the work will be continued.

A brief survey in Grenada [*cf.* **26** 752] suggested that the most serious insect pests of sugar-cane were moth borers of the genus *Diatraea*. No recoveries were made of *Dasyscapus parvipennis*, Gah., introduced about 12 months previously from Trinidad for the control of *Selenothrips rubrocinctus* on cacao ; the most generally important insect infesting this crop was the Lamiid, *Steirastoma depressum*, L. *Coccus viridis*, Green, was the most serious pest of limes, but was controlled on many estates by spraying. Other pests of limes were a beetle, probably *Diaprepes* sp., and *Orthezia praelonga*, which in a few instances attacked grapefruit.

OLIVER (R. W.). **Deciduous Trees and Conifers more commonly used for Ornamental Purposes throughout Canada.**—*Publ. Dep. Agric. Canada* no. 599, 68 pp., 33 figs. Ottawa, April 1938.

The final section of this bulletin (pp. 65–68) is by E. B. Watson and contains popular notes on the habits and control of the commoner insect pests of ornamental trees in Canada.

STIRRETT (G. M.). **A field Study of the Flight, Oviposition and Establishment Periods in the Life Cycle of the European Corn Borer, *Pyrausta nubilalis*, Hbn., and the Physical Factors affecting them.**—*Sci. Agric.* **18** nos. 7–11 pp. 355–369, 462–484, 536–557, 568–585, 656–683, 23 figs., 95 refs. Ottawa, March–July 1938.

The following is based on the author's summary of this account of a detailed quantitative study of the periods of flight, oviposition and larval establishment in the life-cycle of *Pyrausta nubilalis*, Hb., and the physical factors affecting them, made at Chatham (Ontario) during 1927–36 [*cf. R.A.E.*, A **26** 486] : The methods of study are outlined in some detail. The seasonal limits of the flight period were found to be on the average 1st and 27th July, with the peak on 9th July. Moths were usually absent for about six days during each season, making an actual flight season of about 20 days. Moths were caught in a light-trap earlier and later in the season than in the maize field, but the peaks of flight to maize and to light occurred at about the same time. Captures at light late in the season indicated the presence of a very small second generation in some years. The largest flight occurred during 1927 and the smallest during 1935. The percentage of males in maize fields varied from 0 in 1927 and 1928 to 41 in 1934, the average percentage for the 10 years being 15·5, whereas

in light-traps it was 74·7. Males tend to emerge from the pupae before females, but do not appear in the field before them. There is a period longer than the preoviposition period between emergence and flight to the maize fields, which may be explained by the fact that the males, which emerge earlier, are not strongly attracted to maize. Flight takes place on each favourable night, beginning about half an hour before sunset; 94·7 per cent. of the moths fly between 1 and 5 hours later. No sexual differences in the time of night at which flight occurred were noted. The desirability of using sunset time in studying the flight of nocturnal insects is pointed out, and their time of activity is discussed from the literature. Adults of *P. nubilalis* fly at the same period of the night as do certain other Lepidoptera studied by other authors. The reason why insects fly at night and usually at definite periods has not been ascertained. The value of light-traps in the study of the biology and periodicity of insects is discussed, and it is shown that there is no relation between the magnitude of flight in the field and that indicated by catches in light-traps. However, the seasonal limits of flight can be better measured in a light-trap than in any single maize field.

The optimum temperature for flight was 65–70°F. [*cf.* **16** 80; **18** 470], and the lowest temperature at which flight was observed was 56°F. Lowering the temperature below 65°F. inhibits flight much more quickly than raising it above 75°F. The number of moths in flight is positively related to the temperature on individual nights. Average seasonal temperatures apparently do not regulate the duration of the flight season. The flight season was longest in the two years with the lowest average temperatures, but in no other case did seasonal temperature affect its duration, which was not shortest in the hottest and driest season. During the period 1927–36, most moths flew when humidity was high, 90 per cent. flying when saturation deficiency was 0–6 mm. No correlation could be found between moth flight and humidity on individual nights. Rain at 0·14 inch per hour usually inhibited flight, but moths flew in light rains. Moths flew immediately after one thunderstorm, but they did not fly for at least two hours after another. Wind, at velocities up to 17 miles per hour, did not affect flight, and lunar periodicity influenced neither the time at which the annual flight occurred nor the daily rhythm. Atmospheric pressure, mists, fogs and cloudiness failed to influence flight. Moisture in the form of dew and guttation appeared to have no relationship to insect activity.

There is a considerable difference from year to year in the length of the period between the beginning of flight and the peak of oviposition. The average number of eggs laid per female per 100 plants per season was 8·5. The fewest eggs were laid in 1927 and 1928, the coolest and wettest years experienced, and the most in 1934–36, the hottest and, on the whole, the driest years. Temperatures on individual nights did not influence the number of eggs laid per female per night. Of the total number of eggs deposited, over 90 per cent. were laid on the lower surface of the leaves in 9 years out of 10; most of the remainder were laid on the upper surface and occasionally an insignificant number on the culm. Total egg mortality ranged from 4·8 per cent. in 1928 to 34·1 in 1934. All eggs dislodged from the plants were counted as dead, and mortality from this cause ranged from 1 per cent. in 1928 to 34 per cent. in 1934. High mortality through dislodgement is caused by a series of alternate hot days and cold nights, the masses

probably being mechanically loosened from the leaves by the alternate wilted and turgid condition of these. Egg-masses were not dislodged during continued hot, dry periods. The slight mortality occurring among eggs remaining on the leaves was not due to parasites or predators. Mortality was about the same in egg-masses on the upper and lower surfaces of the leaves.

Larval mortality varied from 42·8 per cent. in 1931 to 92·4 per cent. in 1930. It increased with sudden heat and was independent of humidity, and not greatly influenced by rain or hot, dry periods. Larval activity and climatic factors were studied by correlating them within periods of five days. A climatograph for the microclimate of the plots within each period of five days was devised, the average temperature being plotted with the average saturation deficiency for the first time. The fact that a population index, calculated by multiplying together the number of females in flight, the number of eggs laid per female per 100 plants per season and the rate of total survival, was found to show the trend of borer population over wide areas, indicates that the physical factors causing variations at observation plots act also over such areas. This is generally true of temperature, which has been shown to affect mortality, and of humidity, but not of wind and rain, which do not. The biotic factors contributing most largely to annual fluctuations in borer populations during the period of the life-cycle under study were the initial available moth populations, egg production per female, egg mortality and larval survival. The years under study were classified according to their favourableness to borer development, 1928 being favourable, 1932, 1933 and 1936 above the average, 1929, 1931 and 1935 below average and 1930 and 1934 unfavourable. The biotic factors causing a decrease or increase in population in each year are given. Pupal mortality and the clearing of maize refuse have an important influence on moth population. In 1934, excessive heat and lack of moisture caused extremely high mortality among pupae. Similar conditions were present only in the years 1927 and 1928, when large reductions in the larval populations took place, partly due, no doubt, to the clearing of maize refuse and to pupal mortality.

Saunders (L. G.). **Migration of Moths of the Beet Web-worm.**—*Canad. Ent.* **70** no. 8 p. 176. Orillia, Ont., August 1938.

First-generation adults of *Loxostege sticticalis*, L., were abundant in Saskatchewan in 1938, and R. C. Pengelly reports a considerable migration of them in the south of the province in June. The swarm of moths was several hundred yards wide, about $\frac{3}{4}$ mile long and about 40 feet high. Its density was about 20 moths per cubic foot. The moths were flying southwards and some covered about 5 miles in a day.

Park (T.). **A Note on the Size and Composition of old *Tribolium confusum* Populations.**—*Amer. Nat.* **72** no. 738 pp. 24–33, 9 refs. New York, N.Y., 1938.

The following is substantially the author's summary of continued investigations on the effect on *Tribolium confusum*, Duv., of the modifications it brings about in its environment : An analysis of the composition of 200 cultures of *T. confusum* after one year's growth in four initially distinct types of flour showed that the size of the total

population is inversely proportional to the initial conditioned flour content of the medium [*cf. R.A.E.*, A **23** 278 ; **24** 613]. This difference is due largely to the number of adults and larvae, and not to the eggs and pupae. In all cultures, the adults display less variability of numbers than the eggs and larvae. The pupae comprise less than 0·3 per cent. of the entire population. The total number of dead adults is quite similar for each flour series, but they are found in relatively greater abundance in the conditioned than in the fresh series. All the cultures lose weight during the year's growth period. This loss is attributed to the escape of metabolic waste products into the atmosphere. It is shown to vary directly with the total size of the population.

McDaniel (E. I.). **Observations on Control of Cankerworm by Sprays.**—*Quart. Bull. Mich. agric. Exp. Sta.* **21** no. 1 pp. 32–34, 1 fig. East Lansing, Mich., August 1938.

The results of experiments in Michigan on sprays against *Palaeacrita vernata*, Peck, and *Alsophila pometaria*, Harr., chiefly on elm, are given in a table. Application of a spray containing 4 per cent. dormant oil to trees before growth started in the spring prevented an infestation by *Alsophila*, and trees so sprayed were not attacked by *Palaeacrita* if bands of cotton or adhesive were applied immediately after spraying. Neither species injured trees to which a spray consisting of 3 lb. lead arsenate, 1 U.S. quart summer oil and 100 U.S. gals. water was applied at a pressure of 600–800 lb. when the leaves were half-grown ; the loss of foliage was much greater and control was more difficult if the trees were in full leaf or the larvae more than half-grown. Sprays containing lead arsenate with an oil as a spreader and adhesive appeared satisfactory, but the larvae may hang from their threads for a week or more. Where this is objectionable, the addition of pyrethrum or the use of derris or cubé, both with resin residue, is suggested since these insecticides killed the larvae almost instantaneously.

Woodworth (C. E.). **The Reactions of Wireworms to Arsenicals.**—*J. agric. Res.* **57** no. 3 pp. 229–238, 10 refs. Washington, D.C., August 1938.

Experiments to ascertain the reason for the failure of baits poisoned with arsenicals to attract and kill wireworms were carried out with *Pheletes* (*Limonius*) *canus*, Lec., one of the most injurious species in the Pacific Northwest. The larvae were confined singly for from 4 to about 30 days in separate cages, consisting of two microscope slides held apart by metal supports and filled with a pad of moist cellucotton. Pellets were made of moistened maize starch that had been stained with dyes or had been mixed with lamp-black, finely ground graphite or various arsenicals, and a single pellet was placed in one corner of each cage. Wireworms were repeatedly observed burrowing into the poisoned pellets, but those that appeared to feed did not die. Certain of the pellets, however, were markedly repellent, and their repellency was found to be roughly in proportion to the solubility of the arsenical in them. Nevertheless, the highest mortality resulted from sodium arsenate and arsenite, which were highly repellent, and highly soluble. Most of the wireworms that were killed had not attacked the poisoned pellets, and arsenic was not present in their digestive tracts, though

it was found in large quantities in the blood. Larvae of *P. canus* have a closing mechanism in the buccal cavity, by which they can prevent the passage of repellent substances, apparently even in solution, and this is thought to explain the rejection of arsenicals by them. The fact that soil particles were never recognisable in the gastric contents appeared to support the view that foods must be in solution before they can be ingested by wireworms ; but the presence of lamp-black in the digestive tracts of several of the larvae and the rejection of the slightly larger particles of fine graphite showed that solids may be ingested if the particles are sufficiently small. It appeared that the maize starch was partly digested before reaching the stomach.

In the tests in which arsenic was found in the blood of the larvae it was also found in the moist pads on which they were confined, so that it might have entered through the integument. When wireworms were submerged in arsenical solutions, the arsenic did not enter the body through the mouth, anus or tracheae but only through the integument, which was found to be pervious to water and to the sodium salts of arsenic.

Soraci (F. A.). **Persistence of *Tortilia viatrix* Busck.**—*J. N.Y. ent. Soc.* **46** no. 3 p. 320, 2 refs. New York, N.Y., September 1938.

The fumigation carried out in 1933 against *Tortilia viatrix*, Busck, in dry senna leaves stored in New Jersey [*R.A.E.*, A **22** 572] reduced the infestation considerably, but the pest was still present in August 1934. The senna was stored in bags and the amount involved was considerable (about 645,000 lb.). Fumigation in September with hydrocyanic acid gas (2 lb. sodium cyanide per 1,000 cu. ft.) for 25 hours gave complete mortality of the individuals in check vials, but infestation of the leaves has continued, in spite of lack of moisture, adults being still observed in 1938.

Sorenson (C. J.) & Thornley (H. F.). **Mormon Crickets and their Control in Utah since 1923.**—*Proc. Utah Acad. Sci.* **15** pp. 63–70, 1 ref. Provo, Utah, 1938.

Tables show the acreage affected by outbreaks of the mormon cricket [*Anabrus simplex*, Hald.] in various localities in Utah in 1935, 1936 and 1937, and details are given of the work involved in control during the last two years. Outbreaks in 1923, 1932 and 1933 are also briefly recorded. The total expenditure in 1937 amounted to about £7,000 ; it is thought that the value of the farm crops saved was about 5 times this sum.

Knowlton (G. F.), Smith (C. F.) & Harmston (F. C.). **Pea Aphid Investigations.**—*Proc. Utah Acad. Sci.* **15** pp. 71–80. Provo, Utah, 1938.

As a result of a cold late spring, infestation of early peas by *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.) was slight or moderate in Utah in 1937 ; but a few late crops were severely damaged in the northern part of the state [*cf. R.A.E.*, A **25** 622]. Fumigation by means of a nicotine vaporiser [*cf.* **26** 21, 387] gave approximately 99 per cent. control, but most of the predators that survived the treatment died for lack of food or dispersed to

untreated crops, so that when the Aphids migrated back, they sometimes increased rapidly and became more abundant 10–15 days after treatment than they were in the neighbouring untreated pea fields. Good control was obtained with sprays of 3 lb. derris or cubé (4 per cent. rotenone) in 100 U.S. gals. water with Lethane spreader [*cf.* **26** 128, etc.]. Proprietary derris dusts containing 1, 2 or 3 per cent. rotenone gave a fairly heavy mortality rate, but one containing 0·5 per cent. rotenone did not give significant control.

Studies were carried out on the life-cycle and feeding habits of various predators. A special rearing technique was used, one of the advantages of which was that a relatively high humidity was maintained, which is desirable for *Macrosiphum*. The eggs of the predators were usually incubated in Petri dishes, and the newly hatched larvae transferred singly to small glass cylinders, with the upper end covered with gauze, containing Aphids on the terminal leaf of a sprig of lucerne. These small cages were placed on gauze stretched over dishes of water ; and the cut ends of the lucerne sprigs were thrust through the gauze into the water. During the spring and until about mid-July the necessary Aphids could be obtained in the field, but after this it was more economical to rear them on pea seedlings in trays or on the new shoots of recently potted lucerne plants.

Syrphid larvae were the most numerous and effective predators in pea and lucerne fields in northern Utah in 1937, and adults of 19 species were taken. The dominant species were *Lasiophthicus* (*Scaeva*) *pyrastri*, L., in the early part of the season, and *Eupeodes volucris*, O.S., in late June and July. The durations of the egg, larval and pupal stages of *E. volucris* were 3, 8–12 and 7–9 days, respectively.

Coccinellids appeared to be next in importance to Syrphids in 1936 and 1937. Adults and pupae were, however, less conspicuously abundant in pea fields in Utah during 1937 (when 14 species were observed) than in the latter part of the previous growing season. Some ten million adults of *Hippodamia convergens*, Guér., were collected from their hibernation quarters in the canyons and on the mountains of California, and most of them were liberated in the pea and lucerne fields of northern Utah and southern Idaho on 29th May and 5th June 1937. The beetles became widely dispersed before the Aphids were abundant [*cf.* **13** 24], and it was difficult to estimate their value in control. In life-history studies, the egg, larval and pupal stages lasted 3, 13 and 6 days, respectively, In the spring and autumn of 1937, *Hippodamia quinquesignata*, Kby., another common predator, was found in great numbers on mountain tops in Utah, occurring under rocks, in depressions in the soil, and in clusters hanging from the branches of many trees and shrubs. In a shaded insectary, the egg, larval and pupal stages lasted 3, 16–17 and 4–5 days.

Chrysopids were less numerous than Coccinellids in the pea and lucerne fields, but were highly effective as predators. Two larvae of *Chrysopa oculata separata*, Banks, became full-grown in 12 days, and pupated on 5th July. The adults emerged on 27th July ; they ate 17–28 Aphids daily.

The predatory Anthocorid, *Orius tristicolor*, White, was often more abundant than *Macrosiphum* on lucerne during August and September. It also occurs on peas. Other predators that were fairly common included *Geocoris decoratus*, Uhl., *Nabis ferus*, L., and *N. alternatus*, Parshley. The snowy tree cricket [*Oecanthus niveus*, DeG.], which has previously been reported to be predacious on *M. onobrychis*, was not

very abundant on peas or lucerne. Under laboratory conditions, it damaged the lucerne foliage more than the few Aphids it ate would have done.

Two parasites, *Aphidius rosea*, Hal., and *Praon simulans*, Prov., were reared from *M. onobrychis* in 1937; both were obtained in various localities in Utah, and *P. simulans* also in Idaho.

Knowlton (G. F.) & Hansen (L. L.). **Notes on Berry Insects of Utah.**—*Proc. Utah Acad. Sci.* **15** pp. 127–130, 1 fig. Provo, Utah, 1938.

Very brief notes are given on some 60 species of insects known or expected to be injurious to bush fruits, strawberries and grapes in Utah, and observations on infestation of dewberries by *Tortrix* (*Cacoecia*) *rosaceana*, Harr. [*cf. R.A.E.*, A **26** 141], dealing chiefly with the dates of occurrence of the various stages in 1937, are recorded in somewhat more detail.

Eyer (J. R.). **Ten Years' Experiments with Codling Moth Bait Traps, Light Traps, and Trap Bands.**—*Bull. N. Mex. agric. Exp. Sta.* no. 253, 67 pp., 12 figs., 11 graphs, 30 refs. State College, N. M., October 1937. [Recd. September 1938.]

The following is taken from the author's summary: Experiments with cane sirup baits and aromatic esters to attract *Cydia* (*Carpocapsa*) *pomonella*, L., were carried on in New Mexico from 1928 to 1937 [*R.A.E.*, A **20** 27; **24** 165, etc.]. Various standard types of light-traps and combinations of baits and light were also tried. Carbohydrate baits attracted about 45 females to 55 males, and the aromatic esters 35 females to 65 males. The most attractive of the various light sources tested [*cf.* **22** 320] were the mercury-vapour types producing 300–700 lumens in the visible region within wave lengths of 3,000–7,000 angstrom units, that is, largely blue, violet and ultraviolet in quality. Electrified grids or suction fan retrieving devices were about equally effective for capturing moths attracted to baits or light. Although apples in baited and illuminated trees were often less infested than those in neighbouring unsprayed trees, the benefit was not so great as that obtained by spraying, and did not warrant the recommendation of the substitution of traps for spraying. However, it is hoped that further improvements will make them practical. Temperature and relative humidity affected catches in bait and light traps when they fluctuated above and below the optimum for moth flight. Attention is directed to statistical methods for determining the significance of direct comparisons of baits or lights, for ascertaining the effect of location on trap efficiency and for the evaluation by the method of variance of large series of attrahents. Experiments with chemically treated bands and certain soil fumigants indicated that both will effectively destroy large numbers of over-wintering larvae without injuring apple trees, and the use of the former is strongly recommended.

Insect Pests.—*Bull. Wisconsin agric. Exp. Sta.* no. 440 (Rep. 1936–37) pp. 18–31, 2 figs. Madison, Wis., May 1938.

Surveys carried out by H. F. Wilson and others in southern Wisconsin in the autumn of 1937 showed that 15–20 per cent. more

grasshopper eggs were present than in the previous year ; from 46 to 93 pods (each containing 20–30 eggs) were found per sq. ft. in some localities.

As a result of experiments on the control of cutworms in central Wisconsin, Wilson and L. D. Beadle recommend baits of 48 lb. bran and 6 U.S. gals. water, poisoned with 1 lb. Paris green or sodium fluoride, or 2 lb. white arsenic, Paris green being the most effective. *Agrotis* (*Abagrotis*) *vetusta*, Wlk., *Feltia ducens*, Wlk., *Euxoa detersa personata*, Morr., and *Peridroma* (*Lycophotia*) *saucia*, Hb., comprised, respectively, 20, 19, 11 and 9 per cent. of the cutworms collected in the field in 1937. From late June until the end of October, 1,841 adult Noctuids belonging to 37 different species were trapped in five light-traps and three bait-traps. The latter were the more effective, and fermenting fruit was the most attractive bait. Collections from lucerne (20th–23rd May), maize (3rd June) and beans (18th June) indicated populations of 59,226, 1,825 and 2,618 cutworms per acre, the principal species being *A. vetusta* and *F. ducens*, *A. vetusta*, and *E. d. personata*, respectively. Several species crawled up the trunks of trees and fed on the foliage. In a cool wet spell in early June, thousands of cutworms, particularly *A. vetusta*, were killed by a fungus.

In 1935, a laboratory was established, in co-operation with the United States Department of Agriculture, to investigate the bionomics and control of *Lachnosterna* (*Phyllophaga*) spp., which are the most destructive insect pests in Wisconsin. From collections of the adults, T. R. Chamberlain, L. Seaton, C. L. Fluke, J. A. Callenbach and P. O. Ritcher have found that the most abundant species are *L.* (*P.*) *rugosa*, Melsh., *L.* (*P.*) *fusca*, Fröl., *L.* (*P.*) *hirticula*, Knoch, *L.* (*P.*) *implicita*, Horn, and *L.* (*P.*) *tristis*, F. In 1935, 1936 and 1937, these five species together comprised 98, 66 and nearly 87 per cent. of all the beetles taken. In 1935, *L. rugosa* was found on 35 species of trees and shrubs, none of which yielded more than 14 per cent. of the total number collected. *L. fusca* also attacked a wide variety of similar plants. The other three species were more restricted in their feeding habits, *L. fusca* feeding predominantly on oak, hickory and hazel, *L. implicita* on willows and poplars, and *L. tristis* on oak. It is therefore unlikely to be feasible to destroy adults of *L. rugosa* and *L. fusca* by means of insecticides, and they may be sufficiently numerous to nullify the results of measures against the other species. Fields sown with barley were the most attractive to the ovipositing beetles, but larvae of most of the common species also occurred in the soil of pastures, woodlands and fields of other cereals ; larvae of *L. implicita* have not yet been found under natural conditions. Systematic surveys by digging showed that many of the grubs died as a result of two months' dry, hot weather in both 1936 and 1937. In two localities, populations of 400,000 and 200,000 per acre in April 1936 were reduced by 90 per cent. by November 1937. As a rule, heat and cold seem to have little effect on the grubs, but various parasitic insects help materially in control. Five series of experiments were carried out to test various insecticides against the beetles, but none was found that would kill them before they began to oviposit.

T. C. Allen and J. W. Brooks found that dusts containing 0·75 per cent. rotenone were more efficient than rotenone sprays or arsenicals in controlling caterpillars on cabbage, which were unusually abundant in 1937. Talc, gypsum and clay are the best carriers [*cf. R.A.E.*, A **25** 560].

In work by Allen on the control of the squash vine borer [*Melittia satyriniformis*, Hb.] by means of substitutes for stomach poisons [*cf.* **24** 65], four applications of various contact sprays against the eggs were made at weekly intervals beginning on 6th July. The best results were given by nicotine sulphate (1 : 400), with sodium lauryl sulphate (1 : 1,000) as spreader. A derris spray was improved by the addition of 2 per cent. oil emulsion. Sodium lauryl sulphate, which is now commonly used in soap flakes and other household products, gives excellent results as a wetting and spreading agent in vegetable sprays, as unlike common laundry soap, it does not precipitate calcium and magnesium salts in hard water and thereby clog the spraying equipment. This substance is not injurious to cabbage plants even when used at concentrations 12 times as strong as is necessary.

Tests carried out by C. D. Harrington, E. M. Searls and R. A. Brink on the susceptibility to the pea aphis [*Macrosiphum onobrychis*, Boy.] of 164 varieties of canning peas suggested that those with slender, tall, yellow vines were more resistant than the dwarf, stocky succulent types. A comparative test with two varieties also indicated that the loss of plant weight (green or dry) that results from infestation may serve as an index of susceptibility in attempts to breed resistant varieties.

As a result of two dry summers, infestation by codling moth [*Cydia pomonella*, L.] was more severe in 1937 in one apple-growing locality than at any other time in recent years. Orchards exposed to road dust appeared to be most heavily infested. Spray residues tend to dry in patches on the surface of an apple, and road dust sticks more readily to these patches than to smooth surfaces. Callenbach considers that the larvae tend to avoid these accumulations of dust when they enter the apple and hence are unharmed by the spray.

Munro (J. A.) & Saugstad (S.). **A Measure of the Flight Capacity of Grasshoppers.**—*Science* **88** no. 2290 pp. 473–474. New York, 18th November 1938.

Over 100,000 grasshoppers were sprayed with a fast-drying red lacquer and released on the 17th July 1938 in the south-eastern part of North Dakota. Two days later, three examples of *Melanoplus mexicanus*, Sauss., and one of *M. differentialis*, Thos., were recovered 20 miles to the north-west of the place of release, and other examples of *M. mexicanus* were recovered until 14th August. All the locusts recovered had travelled in the same general direction, probably because the prevailing southerly and south-westerly winds, being warmer than those from other directions, were more effective in promoting sustained flights. The furthest recoveries were made 215 and 214 miles from the place of release, on 31st July and 14th August, respectively.

Keifer (H. H.). **Eriophyid Studies II.**—*Bull. Dep. Agric. Calif.* **27** no. 3 pp. 301–323, 18 pls., many refs. Sacramento, Calif., 1938.

This second paper of a series [*cf. R.A.E.*, A **26** 650] contains descriptions of 18 further species of Eriophyids from California, of which 15 are new, three belonging to two new genera. Brief biological notes and a list of the families and species of plants attacked by them are given. They include *Epitrimerus pirifoliae*, sp. n., on pear, *Calepitrimerus baileyi*, gen. et sp. n., on apple, *Phyllocoptes cornutus*,

Banks, on peach, and *Eriophyes fici*, Essig, from the scales at the blossom opening of Fresno capri figs. There is some confusion about the name of the last species, which Essig consistently credited to Ewing, who has apparently written nothing on it. Moreover, the author considers that if it is not a synonym of *E. ficus*, Cotte [*cf.* **9** 360], it is preoccupied by it. A generic key to the PHYLLOCOPTINAE incorporating the two new genera is given.

PINTO DA FONSECA (J.). **O combate biológico ás moscas das frutas.** [The biological Control of Fruit-flies.]—*O Biologico* **4** no. 7 pp. 221–225. S. Paulo, July 1938.

The importation into Brazil of *Tetrastichus giffardi*, Silv., and its rearing to the seventh generation on *Ceratitis capitata*, Wied., in coffee berries have been recorded [*R.A.E.*, A **26** 627]. Between 26th and 30th May 1938, 7,532 adults, forming part of a ninth generation, were obtained. The release of the parasite in coffee plantations infested by *C. capitata* was begun in April.

C. capitata is not indigenous in Brazil, but there are several native species of *Anastrepha*, and in the state of Bahia, F. Silvestri has discovered many larvae of *A. fraterculus*, Wied., parasitised by *Opius* sp.

AUTUORI (M.). **Pragas da videira.** [Pests of the Grape-vine.]—*O Biologico* **4** no. 7 pp. 229–236, 7 figs. S. Paulo, July 1938.

None of the insects infesting vines in Brazil is at present a serious menace; the chief are *Phylloxera vitifoliae*, Fitch, and *Eurhizococcus brasiliensis*, Hemp. [*cf. R.A.E.*, A **25** 759]. The adults of *Colaspis trivialis*, Boh., which sometimes occur in large numbers and skeletonise the leaves, and those of the Rutelid, *Bolax flavolineatus*, Mann., which feed by night on the leaves and shoots, can be controlled by adding an arsenical to sprays of Bordeaux mixture. Against *Aspidiotus* (*Diaspidiotus*) *lataniae*, Sign., on the stocks and branches, the measures advised are pruning, removal of dead bark, and spraying with lime-sulphur or oil emulsion. *Neolecanium silveirai*, Hemp., attacks the roots, which should be laid bare and washed with either of these insecticides. Oil emulsion is also effective against *Aulacaspis* (*Pseudaulacaspis*) *pentagona*, Targ., if applied before the vines have become severely infested. The imported parasite of this Coccid, *Prospaltella berlesei*, How., is now found throughout Brazil.

MENDES (L. O. T.). **Observações sobre alguns insetos coletados sobre algodoeiro durante os anos de 1936 e 1937.** [Notes on some Insects collected on Cotton in 1936 and 1937.]—*Jorn. Agron.* **1** no. 2 pp. 149–162, 3 refs. S. Paulo, 1938. (With a Summary in English.)

A briefly annotated list is given of 58 species of insects taken on cotton in São Paulo, showing in most cases the frequency of their occurrence and the kind of injury they cause. Besides species of *Dysdercus* [*cf. R.A.E.*, A **25** 18], several other bugs of different families are stated to be carriers of the organisms causing internal boll-rots.

SALT (G.). **Experimental Studies in Insect Parasitism. VI.—Host Suitability.**—*Bull. ent. Res.* **29** pt. 3 pp. 223–246, 3 figs., 46 refs. London, October 1938.

The investigations reported in this paper, which is the sixth of a series [*cf. R.A.E.*, A **25** 405], were made to ascertain the characteristics that determine the suitability of hosts for *Trichogramma evanescens*, Westw. A suitable host is defined as one on which fertile offspring can generally be reproduced. The material and methods were the same as those previously used [**22** 203]. The parasites belonged to a pure strain reared through more than 200 generations on eggs of *Sitotroga cerealella*, Ol. To be suitable, a host must be such that it can be parasitised by the adult and provides an environment in which the progeny can develop. Successful attack may be prevented by resistance offered to the ovipositor by a hard or thick chorion or by inhibition of oviposition. The many different hosts on which *T. evanescens* can be reared offer varying resistance to the ovipositor. Eggs of *Ephestia kuehniella*, Zell., were penetrated in less than a minute, those of *S. cerealella* in just over a minute, those of *Agrotis pronuba*, L., in about 1½ minutes, and those of *Cidaria* (*Hydriomena*) *bilineata*, L., in just under 14 minutes. Eggs of *Orgyia antiqua*, L., completely resisted attack, though, in two cases, drilling continued for more than an hour, and 21 of 23 females, each confined with 3 eggs of *Smerinthus populi*, L., died without being able to effect parasitism, while 2 parasitised one egg each, both of which eventually proved unsuitable. Eggs of *Selandria sixi*, Vollenhoven, appeared to provide an inhibitory stimulus, as parasitised eggs do [**25** 405].

In considering their suitability for the offspring, five physical characteristics of the hosts of *T. evanescens* were investigated. These are the permeability, rigidity, and hardness of the egg-shell and the fluidity and quantity of the contents of the egg. From experiments in which parasitised eggs of *Sitotroga* were kept immersed in various fluids, it appeared that *Trichogramma* can develop in an oxygen tension so low that no insect egg is likely to be unsuitable by reason of impermeability of the shell, and that eggs laid in plant tissues or liable to be covered with water are not thereby rendered unsuitable. Usually a chorion that is too tough for the progeny to bite their way out is tough enough to resist oviposition, but one of the two parasitised eggs of *Smerinthus populi*, dissected 9 days after emergence should have occurred, contained 21 perfect dead adult parasites that had been unable to pierce the shell. It has not been proved whether or not the rigidity of the chorion is a factor of importance to the developing parasite. In addition to fertile eggs, *T. evanescens* was successfully reared in infertile eggs of *Barathra brassicae*, L., in which the contents remained fluid, and in dead eggs of *Sitotroga* killed by heat when less than 24 hours old, and in which the contents must have been at least partly coagulated. On the ninth day after heating, 36 eggs that had not shrivelled were exposed to attack and at least 5 were parasitised, but none supported any observable development of the parasite. *Sitotroga* eggs in which the larva is fully formed but still wet and not hardened are suitable, but eggs more than 120 hours old at 25°C. [77°F.] in which the larva is moving and ready to emerge are usually unsuitable. The mouth parts of the young *Trichogramma* larva cannot deal mechanically with solid tissue, but it is not known to what extent the larva can chemically liquefy the solid parts of its host. Females

do not oviposit in hosts that are too small [**23** 390], but superparasitism may result in such acute food shortage that no parasite can develop. If too much food is present the parasite is unable to take enough to form the empty chamber required for pupation. When the second parasitised egg of *Smerinthus populi* was opened, it contained 7 dead individuals of *Trichogramma*, 4 in an early and 3 in a later stage of pupal development, and all abnormally large with distended abdomens. They may have died as a direct result of over-eating, but more probably through failure to establish the dry surroundings required.

Experiments on the influence of the chemical characteristics of the host as a food on its suitability for the development of the parasite were carried out on eggs of *Sialis lutaria*, L., *Tenebrio molitor*, L., and *Bruchus obtectus*, Say. Females of *T. evanescens* would not attack an egg-mass of *S. lutaria*, but would oviposit in separated eggs. Of 707 believed to have been parasitised, only 20 produced adults of *Trichogramma*, all of which were feeble, had distended abdomens from an excess of ingested but unassimilable matter, and died without being able to reproduce. *S. lutaria* is the natural and entirely suitable host of *T. semblidis*, Auriv., a species closely allied to *T. evanescens* [*cf.* **26** 102], but the adults deposit a copious brown fluid meconium immediately on emergence from *Sialis* eggs, which they do not on emergence from eggs of *Sitotroga*. This indicates the presence of a high proportion of waste matter in the *Sialis* egg. Eggs of *Tenebrio molitor* are eagerly attacked by females of *Trichogramma evanescens*, but not one adult emerged from 423 eggs parasitised under observation and believed to contain, in all, some 3,000 parasite eggs. In some of the eggs, the parasites developed as far as the pupal stage, but those that did so had abnormally large abdomens. Eggs of *Bruchus obtectus* are accepted, though not eagerly. In at least 323 of 702 attacked and apparently parasitised in experiment, the parasite reached the prepupal stage, but only 10 adults emerged, and in other experiments extended over several years, only 36 adults emerged from 14,000 eggs exposed to about 3,000 females. The parasites usually die in the prepupal stage. As eggs of insects feeding on green plants (*Barathra*, etc.), grain (*Sitotroga*, *Ephestia*), carrion (*Lucilia*), mammalian blood (*Cimex*) and living animal matter (*Chrysopa*) and eggs in a great variety of stages and conditions are suitable as food for *T. evanescens*, it would appear that minute quantities of subtle substances rather than gross chemical differences are the factors distinguishing suitable and unsuitable hosts.

Three biological characteristics of the hosts of *Trichogramma* might influence their suitability. Two of these, viability and age, do not directly do so. The third is movement of the embryo. A sudden movement of the larva, when the chorion is pierced and it is pricked by the ovipositor, causes the parasite to withdraw without laying an egg. When the attack is pressed and the movements of the parasite make it appear that an egg has actually been laid, the larva is sometimes still able to hatch.

As various aspects of the question of host suitability cannot be studied on an egg parasite, examples are given from the literature of hosts unsuitable to other species to illustrate them. The known factors of host unsuitability are tabulated. In spite of repeated attempts, it was not possible to develop a strain of *T. evanescens* for which eggs of *Bruchus obtectus* were suitable. The question of host

specificity is discussed, and the importance, in further study, of dividing the subject into host finding, host selection and host suitability is stressed.

WILKINSON (D. S.). **A New Species of** *Apanteles* **(Hym. Brac.) bred from** *Carposina adreptella* **attacking Raspberry in New Zealand.**—*Bull. ent. Res.* **29** pt. 3 pp. 247–249, 3 figs. London, October 1938.

Both sexes of *Apanteles carposinae*, sp.n., are described from material bred from the Tineid, *Carposina adreptella*, Wlk., which attacks raspberry in New Zealand and of which the natural food-plant is thought by D. Miller to be *Rubus australis*. It is stated on the authority of F. J. Jeffreys that the greater part of the larval life of the Tineid is spent boring in the young shoots of raspberry and blackberry, that *A. carposinae* is a solitary parasite, and that occasionally its cocoon is found inside the cocoon of the host.

[KOZHANCHIKOV (I. V.).] KOZHANTSHIKOV (I. W.). **Physiological Conditions of Cold-hardiness in Insects.**—*Bull. ent. Res.* **29** pt. 3 pp. 253–262, 4 figs., 19 refs. London, October 1938.

The following is substantially the author's summary of the results of the investigations reported in this paper: Cold-hardiness in insects depends on the physiological state of the organism; insects in diapause are most resistant, insects that have had their development stopped by cold but have not entered a diapause are less so, and developing insects are practically not cold-hardy. The difference in the cold-hardiness of these three groups depends on the specificity of their cellular respiration. Growing insects show in their cellular respiration the prevalence of oxydases, the activity of which is connected with characteristics of their cellular structures. In cold-hardy insects, the cellular respiration is closely connected with the anoxybiotic processes caused by the dehydrases; their activity is not bound up with the structural elements of the cells, but is closely connected with the presence of non-saturated fat-acids peculiar to insect fats. The respiration of growing or developing insects is entirely and rapidly destroyed by narcotics, cyanide and low temperatures; the effect of these agents is due to the destruction of the cellular structures. The respiration of cold-hardy insects is characterised by its definite thermostable part and is also resistant to narcotics. Destroying the cellular structures does not affect that respiration. Cold-hardiness increases with the increase of the percentage of thermostable respiration. Freezing of the protoplasmic water causes the death of an insect only in the absence of thermostable respiration. Many insects in diapause (characterised by a high percentage of thermostable respiration) can be frozen without any lethal effect. It is clear that the freezing of the free protoplasmic water cannot be considered as an obligatory cause of "anabiosis." The quantity of fat does not show any direct connection with thermostable respiration and cold-hardiness in insects. It is probable that the important factor is the quality of the fats, that is to say, the part played by non-saturated fat-acids. The increase of cold-hardiness in insects after dehydration can be connected with the changes in cellular respiration; the same can be said regarding the general connection of the water content of the protoplasm and cold-hardiness.

CAMERON (E.). **A Study of the Natural Control of the Pea Moth, *Cydia nigricana*, Steph.**—*Bull. ent. Res.* **29** pt. 3 pp. 277–313, 2 pls., 11 figs., 22 refs. London, October 1938.

In view of the serious injury caused to peas in Canada by *Cydia nigricana*, Steph. [*R.A.E.*, A **26** 60], a study of the factors affecting its control in England was undertaken with a view to the introduction of the most effective natural enemies into Canada. All stages of this Tortricid are described (the mature larva and pupa for the first time), a list of its synonyms is given, its distribution is briefly reviewed and its life-history is summarised from the literature [**8** 532; **14** 217; **24** 498] supplemented by the author's observations. In England its numbers are limited by climate, insect parasites, parasitic Nematodes and entomophagous fungi, which kept infestation down to 10–16 per cent. of the pods in south-eastern England in 1935–37.

Three parasites of *C. nigricana* are recorded in the literature from the continent, but none from England. They are *Ascogaster quadridentata*, Wesm., *Glypta haesitator*, Grav., and *Pimpla* sp. The author reared the first two in considerable numbers and a few individuals of a hitherto unrecorded parasite, *Angitia* sp. (near *rufipes*, Grav.), from material collected in south-eastern England during 1935–37. *A. quadridentata*, which oviposits in the egg of the host and the larva of which develops in the host caterpillar, was the most abundant species, an average of 36–45 per cent. of the host larvae being parasitised by it in 1936–37. *G. haesitator*, a purely larval parasite, parasitised an average of 12–14 per cent., and *Angitia* sp., also a larval parasite, 2 per cent. or less. Keys are given to the primary and mature larvae, cocoons and adults of the three species, and their systematic position, host records and distribution are discussed.

G. haesitator is fairly evenly distributed over the pea-growing districts of south-eastern England. The adult, which is described, emerges from the overwintered host cocoon at the end of June or beginning of July, the ratio of males to females being 1 : 2. The female oviposits through the pea-pod and lays a single egg in the larva of *C. nigricana* inside. The larva hatches after 3–4 days, remains in the first instar throughout the summer, and in the second during the winter, and undergoes two further ecdyses in February and May. When it has devoured the contents of its host, it sheds the skin of the latter, constructs a cocoon of white translucent silk, and passes a few days as a prepupa. Before pupation, the faeces, which have accumulated in the gut during the feeding period, are voided. At 25°C. [77°F.] and a relative humidity of about 60 per cent., the pupal stage lasts 7 days. The adult can be kept alive in the laboratory for 3–4 weeks. The immature stages are described, the four larval instars being dealt with in great detail, and the significance of certain structures is discussed.

A. quadridentata was the commonest of the three parasites and was present in all the areas of south-eastern England examined, the attack varying from 7 to 48 per cent. An account of the life-history and a description of the primary larva have been given by H. T. Rosenberg [**22** 491]; a certain amount of new work on the later instars, not covered by him, is recorded, and the biology, as adapted to *C. nigricana*, is briefly recapitulated. The adult emerges from the host cocoon towards the end of June. Pairing takes place soon after emergence, and the female oviposits in the cytoplasm of the host egg.

After 2–3 days the larva hatches and enters the embryo of the host. It remains in the first instar within the host larva until the latter has spun its cocoon and over-wintered, but early in the following summer it passes through two further larval stadia, changes to a prepupa and pupates. The pupal stage lasted 7 days at 26°C. [78·8°F.] and 60 per cent. relative humidity, and the adult lived 3–4 weeks in the laboratory. Descriptions are given of the first-stage larva, mature larva, prepupa and cocoon of the species of *Angitia*.

Pea-moth larvae of a batch collected in September 1936 were found, in the following spring, to be severely infested by Nematodes, and all were eventually destroyed. The Nematodes are thought to belong to a genus resembling, but not identical with, *Neoaplectana* [*cf.* **26** 623]. In various instances the overwintering larvae were killed by fungi; those obtained were identified as *Beauveria bassiana*, *Isaria farinosa* and *Gymnoascus ruber*, the last of which was considered secondary. In the containers in which cocoons were kept in the laboratory, the percentage attack by fungi varied with the amount of moisture. So far, entomophagous fungi have proved of little value in the control of injurious insects.

Pea-growing is confined to the drier and sunnier eastern and south-eastern counties of England, preferably where the soil is a light calcareous loam. *C. nigricana* is not evenly distributed over the pea-growing area, but appears to be confined to the region between Essex and South Lincoln. The limiting factors may be excessive moisture in the soil, which would affect the cocoon stage by favouring fungi, and summer rain, which would curtail oviposition and wash the young larvae off the pods.

Attempts previously made to find cultural and chemical methods of control are recorded, and their inadequacy pointed out. Biological methods are therefore the most promising. Infested peas were collected by examining stocks at canning factories, in the field and at Covent Garden vegetable market. Heavily infested samples were traced back to their source, and large stocks bought. On arrival at the laboratory, the pods were spread out on cool stone to prevent fermentation, and opened, and the infested peas put out on trays. As the larvae matured, they were placed in slightly moist sterilised soil in trays to spin their cocoons, which were transferred to small tins, great attention being paid to the humidity of the soil. If this became dry, it was replaced by a fresh lot, the cocoons being disturbed as little as possible. Adding water direct to the soil in the tins encouraged the growth of fungi. For shipment to Canada, the cocoons were placed in slightly moistened sterilised soil in tin boxes packed in excelsior in large wooden cases. The three species of parasites present in England have been liberated in Canada, and, in addition, attempts are being made there to utilise parasites of *C. molesta*, Busck, including *Macrocentrus ancylivorus*, Rohw., *M. thoracicus*, Nees, and *Ascogaster carpocapsae*, Vier. *M. ancylivorus* and *M. thoracicus* have completed their life-cycle on *C. nigricana* in the laboratory.

Compere (H.). **A Report on some miscellaneous African Encyrtidae in the British Museum.**—*Bull. ent. Res.* **29** pt. 3 pp. 315–337, 9 figs. London, October 1938.

Of the 12 new Encyrtids described in this paper, those reared from identified hosts are: *Gyranusa citrina* from *Pseudococcus kenyae*,

Le Pelley, and *Ferrisiana* (*P.*) *virgata*, Ckll., on coffee in Kenya; *Coccidoxenus claripennis* from *Inglisia conchiformis*, Newst., on *Cajanus indicus* in Uganda; *Diversinervus stramineus* from *Saissetia persimilis*, Newst., in the Transvaal; *Leptomastix bifasciatus* from *Pseudococcus* spp. in Tanganyika and South Africa; *Leptomastix nigrum* from *Pseudococcus* sp. in the Transvaal; *Prochiloneurus clavatus* from *Pseudococcus perniciosus*, Newst. & Willc., on coffee in Tanganyika, *P. filamentosus*, Ckll., in Natal and *Pseudococcus* sp. in Eritrea; *Cheiloneurus latiscapus* from mealybugs parasitised by *Anagyrus* in Natal; *C. carinatus* from *Pseudococcus perniciosus* in Tanganyika, *Pseudococcus* sp. in Eritrea, and *Saissetia persimilis*, *Homalotylus* larvae, *Pseudococcus* sp. and a parasite inhabiting *P. citri*, Risso, in South Africa; *C. angustifrons* from *Ceroplastes africanus*, Green, in the Anglo-Egyptian Sudan; and *C. orbitalis* from *Homalotylus* larvae, Coccinellid pupae and *Saissetia oleae*, Bern., in Natal. Descriptions are given of a female of *Achrysopophagus* reared from *Pseudococcus citri* in South Africa and another from *Pseudococcus* sp. in Tanganyika. Both are considered to be *A. aegyptiacus*, Merc., which was reared from Coccinellids in Egypt, though their characters do not agree entirely with Mercet's description, a translation of which is given. So far as is known, the species of *Achrysopophagus* and *Cheiloneurus* are hyperparasites. Keys are given to the females of the species of *Eusemion*, *Diversinervus* and *Prochiloneurus*, and to the females of the African species of *Leptomastix* and *Cheiloneurus*, with notes on the classification of the species of *Cheiloneurus*. Those discussed include *C. cyanonotus*, Wtstn., from which the author considers *C. chiaromontei*, Merc., to be doubtfully distinct, as he has received a number of specimens with intermediate characters. These include samples reared from various Coccids in Kenya and South Africa, from Coccinellids in Natal and from Syrphids in Sierra Leone.

[Zenyakin (L. A.).] **Зенякин (Л. А.). Zur Frage über den Zusammenhang der thermischen Preferenz mit der Temperaturreaktion des Gasaustausches bei *Operophtera brumata* L. und *Chloridea obsoleta* F. (Lepidoptera).** [Contribution to the Question of the Connection between the thermal Preference and the Reaction to Temperature of the gaseous Exchange in *O. brumata* and *Heliothis armigera*, Hb.] [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 174–180, 2 graphs, 10 refs. Leningrad, 1938. (With a Summary in German.)

The relation between the preference shown by insects for particular temperatures and the changes that take place in their respiration [*cf. R.A.E.*, A **25** 265] was studied in 1936 in Leningrad, the insects used being the adult females of *Operophtera brumata*, L., taken in the field in October, and fifth-instar larvae of *Heliothis armigera*, Hb. (*Chloridea obsoleta*, F.) reared from eggs at 27°C. [80·6°F.] and 100 per cent. relative humidity. These species were selected because in nature they live under very different temperature conditions. The rate of respiration (amount of oxygen consumed per hour per gm. of live weight) was studied at a relative humidity of 100 per cent. and at temperatures ranging from 1 to 35°C. [33·8–95°F.] in the case of the moths and from 17 to 45°C. [62·6–113°F.] in the case of the larvae. The results, which are tabulated and represented in curves, showed that the rate of respiration of females of *O. brumata* is lowest at 2–4°C. [35·6–39·2°F.]. It increases below as well as above these temperatures. The curve

of respiration rises slowly as the temperature increases up to 22–24°C. [71·6–75·2°F.], after which the rise is rapid and pronounced. In a temperature-gradient apparatus the adults of both sexes of *O. brumata* tended to congregate at the coldest end, where the temperature was below 4°C. Thus, the preferred temperature and that at which oxygen consumption was lowest were the same. This was also true for larvae of *H. armigera*, as they preferred temperatures ranging from 24 to 33°C. [75·2–91·4°F.], which were within the temperature zone in which their consumption of oxygen was lowest. The author concludes, therefore, that the temperature preference in both species depends on the physiological peculiarities of the organism and on the state of metabolism. Temperatures that result in the lowest expenditure of energy (the zone of decreased rate of respiration) are preferred. The preference shown depends on the regulatory reaction of the species of insect to temperature; in eurythermic insects, such as locusts, a preference for certain temperatures is less pronounced than in decidedly stenothermic insects, such as lice.

[Kozlova (E. N.).] **Козлова (Е. Н.).** *Opatrum triste* **Stev. an der Südküste der Krim (Coleoptera, Tenebrionidae).** [*O. triste* under the Conditions of the southern Coast of the Crimea.] [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 181–196, 9 figs., 21 refs. Leningrad, 1938. (With a Summary in German.)

An account is given of the bionomics of *Opatrum triste*, Stev., a pest of tobacco on the southern coast of the Crimea, based on field and laboratory observations in 1928–30. All stages of this Tenebrionid are described. In the Crimea, it is abundant only along a short stretch of the southern coast where the summer is usually hot and dry and the winter and autumn are warm and humid.

The adults hibernate in the soil or under stones or other shelter and begin to emerge about the end of March, when the air temperature is not less than 5–7°C. [41–44·6°F.] and the soil temperature is a little higher. They feed on the tender leaves of various plants and begin to pair and oviposit early in April. The eggs are laid singly, just below the surface of soft loose soil in places free from vegetation and exposed to the sun. Females in the laboratory usually laid totals of about 80 eggs, though the ovaries of those that had not yet started to oviposit contained about 100. Oviposition is at its maximum from about 10th April to mid-May, and ceases about mid-June. The egg stage lasts 18–20 days, and the larval stage, which includes seven instars, averages 95 days. In tobacco plantations, the larvae feed in the spring on the young lateral and sometimes the main roots, weakening the plants and often killing them. From June onwards, they attack the chief root, gnawing out small pits in the surface tissues close to the root collar; the infested plants cease to grow. The larvae usually occur near the surface of the soil, but descend to a depth of 4–6 ins. during periods of drought. The pupal stage is passed near the surface and lasts for 7–8 days. The adults are emerging from late July until October. They feed intensively for a time, but do not become sexually mature until the following spring.

The beetles usually become torpid soon after the temperature on the surface of the soil has dropped below 10°C. [50°F.], but abandon their shelters and resume activity during spells of warm weather. In 1928–29, hibernation in the field lasted from the end of December till March. In the laboratory, the beetles survived a temperature of

—10°C. [14°F.]; but of those kept in soil in glass jars at —17°C. [1·4°F.], 60 per cent. froze to death in two days. The females may live as long as three years; of the overwintered individuals taken in the field in May 1928 and kept in an insectary, some lived for over 1,000 days. The males were less resistant to cold and fluctuations of temperature and usually survived only two winters. The highest male mortality occurred in June–July, soon after the period of pairing was over; most of the females probably die in August–October, when the young adults emerge.

Besides tobacco and various weeds, *O. triste* also attacks vines, vegetables and many oil-producing and medicinal plants. The chief damage is caused by the larvae, as the adult beetles feed almost exclusively on the leaves and only seldom attack the stems. In tobacco plantations, the infestation usually occurs in patches, particularly near places were winter shelter is available, as neither the adults nor the larvae migrate to any extent. On an average, about 5 per cent. of the total area under tobacco in the southern Crimea was infested.

The control measures recommended are: early planting out of the tobacco seedlings so that they are well established before the larvae attack them; destruction of weeds, which serve as food-plants for the beetles before the tobacco is planted and after the lower leaves are picked in summer; keeping the plantations free from refuse that would shelter the hibernating adults; and the use of traps made of planks, heaps of dry grass, etc., under which the beetles congregate during the heat of the day or on cold nights.

[Skoblo (I. S.).] **Скобло (И. С.). The daily Rhythm of Egg-laying in *Euxoa segetum* Schiff. (Lepidoptera, Agrotinae).** [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 197–199. Leningrad, 1938. (With a Summary in English.)

Laboratory observations in Leningrad on the oviposition of *Agrotis* (*Euxoa*) *segetum*, Schiff., the results of which are tabulated, showed that eggs are laid at night and not by day, this rhythm being maintained even when the moths were kept under conditions of constant complete darkness. In this case, however, all the eggs died without starting to develop, and analysis of the sexual glands showed that the moths had not been fertilised, though egg-production by them was not affected. Evidently, pairing does not occur in complete darkness, and in nature it probably takes place at twilight. In the field, the flight of the moths begins soon after sunset, attains its peak towards midnight and ceases 1–2 hours later, and it is possible that the eggs are laid only in the first half of the night, when the moths are active.

[Shabliovskiĭ (V. V.).] **Шаблиовский (В. В.). Biological Notes on the Cerambycid Genus *Saperda* from the Far East.** [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 246–249. Leningrad, 1938. (With a Summary in English.)

Brief notes are given on the flight periods, modes of oviposition and types of larval burrows of seven Lamiids observed in the Russian Far East. Those that occurred in deciduous forests on the mountains were *Saperda scalaris hieroglyphica*, Pall., on *Betula japonica*, *S. octomaculata*, Bless., on *B. japonica* and *Ulmus japonica*, *Eutetrapha* (*S.*) *metallescens*, Motsch., on *Quercus mongolica*, and *E.* (*S.*) *sedecimpunctata*, Motsch.,

on *Tilia amurensis*. *S. laterimaculata*, Motsch., attacked *Pinus koraiensis* in the Ussuri primaeval forests in river valleys and on the slopes of mountains; and *S. carcharias*, L., and *S. populnea*, L., infested willows (*Salix* spp.).

[Fedorov (S. M.).] **Федоров (С. М.). Die Thysanopteren der Kulturpflanzen der Krim.** [The Thysanoptera occurring on cultivated Plants in the Crimea.] [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 250–258, 13 refs. Leningrad, 1938. (With a Summary in German.)

As a result of investigations during a number of years, lists are given of 25 species of thrips found in the Crimea and of their wild and cultivated food-plants. All but one of the thrips have been found on cultivated plants, but serious damage has been caused only by *Thrips tabaci*, Lind., on tobacco, cotton and fennel, *Taeniothrips fedorovi*, Priesn., on *Salvia sclarea*, *Drepanothrips reuteri*, Uzel, on vines, on which it is sporadically abundant, and *Scolothrips longicornis*, Priesn., on soy beans. All these species hibernate in the adult stage, become active in April or May and have several generations a year. *T. fedorovi* infests the flowers of *S. sclarea* so that their development is retarded and the yield of essential oil is reduced. *D. reuteri* first attacks the opening buds on vines and later the young leaves and shoots; in June–July it disappears from the vines and is often found on oaks in forests adjoining the vineyards. *S. longicornis* occurs on soy beans from the time of sprouting till the plants have reached full maturity; it feeds on the leaves, shoots, flowers and pods. The pear thrips, *Taeniothrips inconsequens*, Uzel, does not infest fruit-trees to any appreciable extent in the Crimea, and appears usually to prefer stonefruits to pears.

[Fedorov (S. M.).] **Федоров (С. М.). Die *Otiorrhynchus*arten (Coleoptera, Curculionidae) an Weinrebe in unserer Union.** [Species of *Otiorrhynchus* occurring on Vine in the Russian Union.] [*In Russian.*]—*Rev. Ent. URSS* **27** no. 3–4 pp. 259–260. Leningrad, 1938. (With a Summary in German.)

Lists are given of 17 species of *Otiorrhynchus* collected in vineyards, 12 in various districts in the Crimea and 5 along the Black Sea Coast of the Caucasus. The most important as vine pests in the Crimea were *O. asphaltinus*, Germ., in the south [*cf. R.A.E.*, A **15** 342], *O. brauneri*, Smirn., and *O. impexus*, Gylh., in narrow valleys near Sebastopol and Balaklava and *O. caucasicus*, Stierl., and *O. ovalipennis*, Boh., in the mountainous parts of the south and east. Of the species found on the Black Sea Coast, only *O. turca*, Boh., and *O. rugosostriatus*, Goeze, occurred in pure plantations of vines; the other three species were found in vineyards adjoining orchards, and it is doubtful whether they are pests of vines.

[Emel'yanova (N. A.).] **Емельянова (Н. А.).** Ed. **The Pests and Diseases of Rubber-bearing Plants. Series of Articles II.** [*In Russian.*]—Cr. 8vo, 159 pp., illus., 87 refs. Moscow, All-Un. Rubb. Guttap. sci. Res. Inst., 1938. Price 5 *rub.* 50 *kop.* (With Summaries in English.)

This second series of papers, which deal with investigations on the pests and diseases of rubber-producing plants in the Russian Union

in 1934 [*cf. R.A.E.*, A **24** 710], includes three of entomological interest, of which one has already been noticed [**26** 618].

In Certain Regularities observed in the Distribution of Pests of Tau-saghyz in Kara-tau (pp. 9–21), F. N. Pravdin deals with the local distribution in the Kara-tau mountains (southern Kazakstan) of the six most important insect pests of the different varieties of *Scorzonera tau-saghyz* that grow wild at altitudes of 2,300–5,250 ft. In addition to the five already recorded [**24** 710, 711], they include a Phalacrid of the genus *Tolyphus*, of which the larvae attack the seeds.

M. S. Gilyarov, in Root Aphids and Ants as Pests of Rubber-producing Plants (pp. 49–67), records observations in the Ukraine, most of which have already been noticed [**26** 106]. The green root aphis, *Xerophilaphis scorzonerae*, Mordv., chiefly attacked *Taraxacum megalorrhizon*, to a less extent *S. tau-saghyz* and only slightly *T. kok-saghyz*. Between mid-June and 1st October, 80 per cent. of plants of *T. megalorrhizon* were destroyed by this Aphid in association with the ant, *Lasius niger alienus*, Först. In the absence of the latter, however, the plants were rarely killed, as the sucking of the Aphids alone usually does not cause much damage. The Aphids mostly concentrated near the root collars of the plants, but, although they did not usually occur below a depth of about 3 ins., they were occasionally observed at depths of as much as 7 ins. In experiments to determine the effect of humidity, the Aphids remained on the roots of plants in pots so long as the soil in them was kept dry, but in those that were watered they migrated to the base or lower surface of the leaves, or the petioles.

The chief measure of control is the destruction of wild Compositae in and near the fields of cultivated rubber-producing plants, especially of *Sonchus arvensis*, which is the chief reservoir of infestation by *X. scorzonerae*. Soil-fumigation with chloropicrin in plantations of *S. tau-saghyz* gave complete mortality of the Aphid only when the dosage was 1·2 oz. per sq. yard, which injured the plants. *Lasius* was controlled by applying Paris green round the entrance holes of its nests at the rate of one heaped teaspoonful to each hole. On the fifth day after application, 70 per cent. of the ant-hills in one plot and 94·8 per cent. in another were deserted, and the ants disappeared from the plots. This method was, however, ineffective against large ants of the genus *Formica* and against species that do not make well defined entrance holes in the ant-hills. The use of poisoned honey-baits and the fumigation of the nests with chloropicrin or sulphur dioxide were also ineffective.

[Gilyarov (M. S.).] **Гиляров (М. С.). The Formation of the Fauna of Pests of Kok-saguiz.** [*In Russian.*]—*Priroda* 1938 no. 7–8 pp. 146–148, 4 figs. Moscow, 1938.

In the Russian Union, cultivated *Taraxacum kok-saghyz* (a rubber-producing plant which was discovered in 1931 growing wild in Kazakstan) is attacked by a great number of pests. A brief survey is given of the more important of them, some of which have been noticed from previous papers [*cf. R.A.E.*, A **24** 19; **26** 72, 106, 618]. The foliage is attacked by the larvae of *Loxostege sticticalis*, L., and by the Aphid, *Macrosiphum taraxaci*, Kalt., which migrates from dandelion and is especially injurious in damp places, particularly in turf bogs, which are favourable for the development of *T. kok-saghyz*. The cotyledons and the first leaves of the sprouting plants are attacked

by the weevil, *Tanymecus palliatus*, F., whilst *Lygaeus* (*Spilostethus*) *equestris*, L., *Poeciloscytus cognatus*, Fieb., and *Lygus pratensis*, L., suck the juice out of the capitula. Several species of *Phyllotreta*, especially *P. cruciferae*, Gze., infest *T. kok-saghyz* in the absence of crucifers, particularly in early spring. The seeds in the capitula are eaten out by the larvae of *Heliothis* (*Chloridea*) *dipsacea*, L., *Ceuthorrhynchus punctiger*, Gyll., and the Phalacrids, *Olibrus bicolor*, F., and *Phalacrus fimetarius*, F. (*coruscus*, Panz.). *C. punctiger* oviposits when the capitula are in the phase of bud formation, and the larvae feed on the ovaries of the flowers and later on the seeds; they enter the soil for pupation when the capitula are fully developed and open. The Phalacrids oviposit into flowering capitula, and the larvae destroy the contents of the largest seeds. Larvae of the Tortricid, *Phalonia posterana*, Zell., also feed on the seeds; they abandon the capitula when the cover dries up and pupate in the soil. In the Province of Voronezh, the roots were damaged to a considerable extent by the larvae of an unidentified weevil which, before the cultivation of this plant, bred on dandelion, and in the Ukraine and North Caucasus by the root Aphid, *Xerophilaphis scorzonerae*, Mordv. [*cf.* preceding abstract].

The only practical means of controlling the pests consist in agricultural measures, including the use of manure to increase the resistance of the plants to Aphids, the destruction of wild Compositae in and near the plantations, deep ploughing after the roots have been dug to destroy weevils and root Aphids, harvesting the seeds together with the capitula before they have opened, and drying the seeds to destroy the Phalacrids.

Fulmek (L.). **Neue Winterspritzmittel zur Bekämpfung der grünen Schilcherwanze in Steiermark (Frühjahr 1938).** [New Winter Sprays for combating *Lygus spinolae* in Styria (Spring 1938).]—*Neuheiten PflSch.* **31** pt. 4 pp. 151–156. Vienna, 1938.

Experiments were made in Styria in 1938, with 8 proprietary sprays against the winter eggs of *Lygus spinolae*, Meyer, on grape vines. They were applied towards the end of March, before the growth of the new shoots began, and the stocks were pruned before spraying. The best results were obtained with tar distillates. A Baumspritzmittel [*cf. R.A.E.*, A **24** 797] at concentrations of 8 and 7 per cent. gave 82·18 and 79·73 per cent. control, respectively, and a normal fruit-tree carbolineum with a relatively high content of mineral oil at 6 per cent. gave 78·96 per cent., but caused some injury to the stocks during frost. Two preparations of organic dyestuffs containing dinitrocresol gave 69·54 and 69·41 per cent. control. Frosty weather occurred from 19th to 21st April with temperatures of −6°C. [21·2°F.] and vines sprayed with mineral oil emulsions suffered most, so that these insecticides must be rejected in spite of the good results obtained with them.

Garus (J.). **Gutes Mittel gegen Rote Spinne.** [A good Remedy against Red Spider.]—*Blumen- u. Pflanzenb.* **42** 1938 p. 244. (Abstr. in *Neuheiten PflSch.* **31** pt. 4 p. 166. Vienna, 1938.)

The author states that he has obtained good control of *Tetranychus telarius*, L., on various plants by weekly applications of a spray of 1 lb. soft soap dissolved in 1 gal. hot water and then mixed in 1 gal. cold water and 1 gal. linseed oil.

Steinegger (P.). **Die Reblausverseuchung in der Nordwestschweiz und die Direktträger-Frage.** [Infestation by *Phylloxera* in Northwest Switzerland and the Question of ungrafted Hybrids.]—*Schweiz. Z. Obst- u. Weinbau* **47** pts. 9–10 pp. 161–166, 181–190, 211–214, 5 figs., 1938. (Abstr. in *Neuheiten PflSch.* **31** pt. 4 p. 168. Vienna, 1938.)

The information given here is based on observations in north-western Switzerland in 1937.

The length of the interval between infestation by *Phylloxera* and the death of the vine stock depends on the resistance of the vine or of its parent stock, the race of *Phylloxera* concerned, the soil, which is unfavourable to the Aphid if sandy or very heavy, and the weather, as the Aphid reproduces more quickly in warm years.

In vineyards in which infestation was restricted to a few limited foci, the vines were uprooted, but in cases of severe and widespread infestations, rapid replanting was attempted. Where leaf-galls occurred, the infested stocks and all others for about 9 yards round them were destroyed.

The form of *Phylloxera* found producing leaf-galls on ungrafted hybrids was not the same as the one previously observed in German Switzerland and especially in the canton of Zürich. The great danger of hybrids lies in the fact that they can permit the dangerous aerial developmental cycle of the Aphid. This can only occur if the weather from autumn to spring does not entirely destroy the winged Aphids, their progeny and the winter eggs, and if vine leaves of ungrafted hybrids or of actual American stocks are available for the leaf Aphids from the winter eggs.

The various parent stocks must be tested for resistance against the new race of *Phylloxera* before they are put into use.

Thiem (H.). **Versuche zur Bekämpfung der Pflaumensägewespen mit quassialhältigen Fertigpräparaten.** [Experiments against Plum Sawflies with ready-made Preparations containing Quassia.] —*Forschungsdienst* **5** pp. 553–567. Berlin, 1938. (Abstr. in *Neuheiten PflSch.* **31** pt. 4 p. 172. Vienna, 1938.)

Further experiments in Germany on the use of quassia extract in sprays against the plum sawflies, *Hoplocampa minuta*, Christ, and *H. flava*, L. [*cf. R.A.E.*, A **25** 465] made up to the spring of 1938 confirmed the value of this insecticide. The poor keeping quality of the solution when mixed with soap is due to the latter, for without soap the liquid retained its effectiveness for 100 days at room temperature. The best results were obtained by spraying early or medium blossoming varieties after the petals had fallen, and good results have followed spraying up to a week after the fall. One thorough application suffices, even if the eggs are abundant and the weather unfavourable.

Vogel (R.). **Weiteres über Verbreitung und Lebensweise der Blutroten Singzikade** (*Tibicen haemotodes* **Scop.**). [Further Information on the Distribution and Life History of *T. haematodes*.]—*Jh. Ver. vaterl. Naturk. Württemb.* **93** pp. 116–122, 1 fig., 1 pl., 1937. (Abstr. in *Neuheiten PflSch.* **31** pt. 4 p. 172. Vienna, 1938.)

Tibicen haematodes, Scop., often feeds on the shoots of grape-vines in southern Germany. Nymphs were found on the roots of sloe [*Prunus spinosa*] at a depth of 16 ins., and eggs were observed in a previous year's shoot on another sloe tree nearby. *T. haemotodes*

occurs in Württemberg, Baden and Hesse, and prefers light, warm soils. It has disappeared from the Palatinate because the vines are trained on wire and are well sprayed and dusted, and because chemical manures are used and sloes have been cleared away.

KUNIKE (G.). **Zur Lebensweise der Teppichkäfer.** [The Life-history of Carpet Beetles.]—*NachrBl. dtsch. PflSchDienst.* **18** no. 9 pp. 79–81, 3 figs. Berlin, September 1938.

During the past ten years injury to woollen goods, furs and insect specimens by the larvae of *Anthrenus* spp. has become increasingly frequent in Germany. Of the five native species, *A. scrophulariae*, L., and *A. verbasci*, L., are the most injurious, the former preferring wool and the latter dead insects when both foods were offered, *A. pimpinellae*, F., has only rarely caused damage, and *A. museorum*, L., and *A. fuscus*, Ol., have not been noticed as household pests.

Characters differentiating the adults, larvae and pupae of these species are briefly noted. About 66 per cent. of the larvae from eggs laid by *A. scrophulariae* in May or June transform in September to adults that remain in the last larval skin until the following spring. The rest of the larvae suspend feeding in winter, resume it in spring, and pupate in summer, and the adults emerge in the following year. The larvae of *A. verbasci* hatch in May or June, feed throughout the whole year and pupate in spring, the adults emerging soon afterwards.

Latvijas Augu aizsardzibas institūta darbibas pārskats par 1937–1938 gadu. [Report of the Latvian Institute for Plant Protection for 1937–38.]—[*Rep. Latv. Chamb. Agric. 1937–38*] Demy 4to, 12 pp., 2 graphs. Riga, 1938. (With Summaries in English.)

This report includes (p. 2) a list of pests and diseases of cultivated plants observed in Latvia during 1937–38 ; it contains over 30 species of insects, with brief notes on their distribution and the extent of the damage they caused. Laboratory and field observations on *Apion seniculum*, Kby., a serious pest of alsike clover [*Trifolium hybridum*] were continued [*cf. R.A.E.*, A **26** 256], and an account of these is given by E. Ozols (pp. 5–8). Females deposited 44–262 eggs, with an average of 171. Those allowed to oviposit on plants cultivated in soils fertilised with different kinds and amounts of manure did not show a preference for plants treated with any particular manure, but in all cases preferred those that were well developed. Most of the hibernating weevils occurred along the edges of ditches, and only a few were found in the fields. The males were definitely more numerous than the females, though in the laboratory they were only slightly so ; it is possible, therefore, that in the field some of the females hibernate elsewhere. In experiments on the resistance of the weevils to low temperatures, all died in 24 hours when transferred from 10 to −20°C. [50 to −4°F.], or in 7 days when transferred to −10°C. [14°F.]. In experiments in which weevils were exposed to temperatures varying from 35·8 to 12°C. [96·44–53·6°F.] and a relative humidity of 60 or 100 per cent., the highest mortalities occurred at 14 and 17°C. [57·2 and 62·6°F.] with 100 per cent. humidity, and at 35°C. [95°F.] with 60 per cent. Single individuals survived submergence in water for up to 21 days. The weevils did not feed unless the temperature was above 10°C. [50°F.]. Burning the edges of ditches to destroy the hibernating weevils appears to be the best means of control.

PAPERS NOTICED BY TITLE ONLY.

CHAUVIN (R.). **Morphologie et pigmentation externes de** *Schistocerca gregaria* **Forsk.** (*transiens dissocians*).—*Bull. Soc. Hist. nat. Afr. N.* **29** no. 3–4 pp. 249–267, 4 figs., 9 refs. Algiers, 1938.

KNOWLTON (G. F.) & SORENSON (C. J.). **Utah Grasshoppers of 1937** [surveys of distribution and prevalence].—*Proc. Utah Acad. Sci.* **15** pp. 81–87, 2 refs. Provo, Utah, 1938.

KNOWLTON (G. F.). **Lizards in Insect Control** [including notes on stomach contents of 9 species in Utah].—*Ohio J. Sci.* **38** no. 5 pp. 235–238. Columbus, Ohio, September 1938. [*Cf. R.A.E.*, A **23** 33, etc.]

RAU (G. J.). **Four more new Species of Mealybugs** [one of a new genus] **from New York State. (Hemiptera : Kermidae and Pseudococcidae).**—*Canad. Ent.* **70** no. 8 pp. 157–165, 4 figs. Orillia, Ont., August 1938.

HEMPEL (A.). **Descripção de uma nova especie de** *Ceroplastes* **(Hom. Coccidae).** [*Ceroplastes itatiayensis*, sp. n., on an unidentified plant in Brazil.]—*Rev. Ent.* **8** pt. 3–4 pp. 263–264. Rio de Janeiro, 25th June 1938.

SILVESTRI (F.). **Descrizione di un nuovo genere di Margarodinae (Insecta, Coccidae) della Cina.** [Description of a new Genus of MARGARODINAE from China (*Promargarodes*, gen. n., with type *sinensis*, sp. n.).]—*Notes d'Ent. chin.* **5** pt. 3 pp. 21–27, 3 figs. Shanghai, 13th May 1938.

LUPO (V.). **Revisione delle cocciniglie italiane II.** [A Revision of Italian Coccids II (6 genera of DIASPINAE).]—*Boll. Lab. Zool. Portici* **30** pp. 255–322, 35 figs. Portici, 20th July 1938. [*Cf. R.A.E.*, A **26** 496.]

GOUX (L.). **Notes sur les Coccides (Hem.) de la France (24e note). Etude d'un** *Phenacoccus* **inédit** [*parietaricola*, sp. n.] **de Provence et de Corse.**—*Bull. Soc. ent. Fr.* **43** no. 11–12 pp. 143–149, 13 figs., 9 refs. Paris, 1938.

HOFMANN (C.). **Der heutige Stand der Bekämpfung und Abwehr der Weisstannenlaus** *Dreyfusia nüsslini* **C. B.** [The present Position of combative and preventive Measures against *Chermes nordmannianae*, Eckstein, on *Abies* in Germany.]—*Anz. Schädlingsk.* **14** pt. 8 pp. 88–91, 4 figs., 5 refs. Berlin, 15th August 1938. [*Cf. R.A.E.*, A **25** 727 ; **26** 661.]

Weitere Kartoffelkäferfunde an der Westgrenze. [Further Records (between 5th June and 19th July 1938) of the Potato Beetle (*Leptinotarsa decemlineata*, Say) on the western Frontier of Germany.]—*NachrBl. dtsch. PflSchDienst* **18** nos. 8–10 pp. 68–69, 81–82, 88–90. Berlin, August–October 1938. [*Cf. R.A.E.*, A **26** 719.]

KALSHOVEN (L. G. E.). **Invloed van insecten op de kwaliteit en verhandelbaarheid van indische landbouwproducten.** [The Effect of Infestation by Insects on the Quality and Marketability of agricultural Products in the Netherlands Indies.]—*Versl. 25e Vergad. Ver. Proefst. Person. Buitenzorg 1937* pp. 22–69, 3 pp. refs. (Repr. in *Landbouw* **14** p. 70 et seq.) Buitenzorg [1938]. [See *R.A.E.*, A **26** 453.]

IMPERIAL INSTITUTE OF ENTOMOLOGY.

LIBRARY LACUNAE.

The Institute will be greatly indebted to readers who may be able to supply any of the following, which should be sent to the Assistant Director, Imperial Institute of Entomology, 41, Queen's Gate, London, S.W.7

The Kenya and East African Medical Journal (Nairobi): Vol. II Nos. 2–3 (1925).

Natuurhistorisch Maandblad (Maastricht): Jaarg. I (1912): II (1913) Nos. 1–4, 6–9; V (1916) Nos. 3–4; VII (1918) Nos. 6–9; VIII (1919) No. 4.

New Jersey State Department of Agriculture (Trenton, N.J.): Bulletin 2; Circular: 2, 12, 29 (1917–19).

New York State Museum (Albany, N.Y.): Bulletin: 26 & 57 (1899–1902).

Ontario Entomological Society Report (Toronto): 9th (1878).

Ormerod (E. A.). Observations of Injurious Insects and Common Farm Pests during the Years 1877 & 1878 (London, 1878–79).

Philippine Agriculturist and Forester (Manila):
Vols. II Nos. 1–3 (1912); III Nos. 1, 2 (1914); IV No. 4 (1915).

Philippine Journal of Science (Manila): Vol. I (1906) No. 10.

Porto Rico Department of Agriculture, &c. (San Juan):
Journal, Vol. I (1917) No. 3.

Psyche (Boston, Mass.): Vols. XI (1904), XIII (1906), XVI (1909).

Records of the Egyptian Government School of Medicine (Cairo): Vol. I.

Revista de Agricultura de Puerto Rico (San Juan):
Vols. I (1918) Nos. 1–2; II (1919) Nos. 5–6; III (1919) Nos. 3–4; VIII (1922) No. 2; IX (1922) Nos. 5–6; X (1923) Nos. 1, 5, 6.
Indices to Vol. VI–XVI.

Revista Chilena de Historia Natural (Santiago): Año XIV (1910) Nos. 4–6; XV (1911) Nos. 1 and 3 to end; XVI, XVIII, XXVI (1912, 1914, 1922).

Revista de Veterinaria e Zootechnia (Rio de Janeiro):
Annos I–II (1911–12). Anno III (1913) Nos. 1 to 3, and 5.

La Revue de Phytopathologie appliquée (Paris): Tome I Nos. 22–23 (April-May, 1914).

Rhodesia Agricultural Journal (Salisbury):
Vol. I Nos. 1, 3–6; II Nos. 2–4; III Nos. 1, 2, 6; IV No. 4; V No. 4 (1903–08); VII (1909–10) Nos. 1 & 6; IX (1912) No. 5; X (1912) No. 1. Title pp. and indices to Vols. I–V, VII, VIII, X.

Rivista di Patalogia vegetale (Florence): Vols. VII–X (1899–1904).

Sciencia medica (Rio de Janeiro): Annos I–II (1923–24).

South London Entomological and Natural History Society:
Report, 1879–84.

Tennessee Agricultural Experiment Station (Knoxville):
10th (1897), 12th (1899), and 16th (1903) Annual Reports.

Tennessee State Board of Entomology (Knoxville):
Bulletin: 15, 24, 25, 28, 29, 34, 39.

Teysmannia (Batavia): 32ste Jaarg. (1921) 10e Afl.

De Thee (Buitenzorg): 6e Jaarg. (1925) No. 1.

Tijdschrift over Plantenziekten (Wageningen):
Jaarg. I (1895) and XVI-XVII (1910–11).

Timehri: The Journal of the Royal Agricultural and Commercial Society of British Guiana (Demerara):
Third Series, Vols. I Nos. 1–2; II No. 2 to end; III Nos. 2 to end; IV–V (1911, 1913–18).

United States Department of Agriculture (Washington, D.C.):
Howard (L. O). Report of the Entomologist, 1895.

Virginia: Agricultural Experiment Station (Blacksburg, Va):
Bulletins 24, 61 (1893–96). Technical Bulletin 8 (1915).

Virginia: 1st Annual Report of the State Inspector for San José Scale, 1896–97 (Richmond, Va., 1897).
4th Report of the State Entomologist and Plant Pathologist (Richmond, Va., 1905).

West Indian Bulletin (Barbados): Title-page & Index to Vol. IV.

Zeitschrift für das Landwirtschaftliche Versuchswesen in Österreich (Vienna): 21. Jahrg. (1918) Hefte 1–3 & 10–12.

NOTICES.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Institute are requested to communicate with the Assistant Director.

The Annual Subscription, *in advance*, to the Review, Series A (Agricultural), is 30s. post free; Series B (Medical and Veterinary), 15s. post free. Subscriptions to the *current* Volume received after 30th June in each year will be charged at the published price *viz.*: Series A, 36s.; Series B, 18s. Prices of Back Volumes on application.

Orders and subscriptions should be sent direct to the Assistant Director, Imperial Institute of Entomology, 41, Queen's Gate, London, S.W.7, or through a bookseller.

CONTENTS.

CONTENTS—*cont.*

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by the South Essex Recorders, Ltd., Ilford.

(2712) Wt. P9/3656 1700 1/39 S.E.R. Ltd. **Gp. 432.**